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Noise Data Acquisition and Display System (NDADS3) User's Guide and Tutorial

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FOR THE COMMANDER

//Signed//

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14. ABSTRACT

The Noise Data Acquisition and Display System (NDADS) is an interactive tool for the user-enhanced automation and creation of flight tracks and profiles for noise analysis based on radar tracking data. The NDADS system features graphical methods for the rapid creation of vectored flight tracks with statistical guidance via gate penetrations and visual references based on background maps. Profiles, including altitude, velocity, and power, critical for the evaluation of noise contours, may also be generated easily. NDADS generates files which may be read directly into the NMAP Noise Analysis system. This document describes the NDADS Version 3, which supports NMAP 5 and NMAP 7 formats, and instructs the user towards the development of aircraft flight tracks and profiles.

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PREFACE

The work reported herein was conducted by Wyle Research, Arlington VA, through subcontract from Veridian Engineering, Dayton OH, under Air Force contract F41624-95-C-6014, program element 62202F, work unit 71841611. The program was managed in the Battlespace Acoustics Branch, Human Effectiveness Directorate, Air Force Research Laboratory, Wright-Patterson AFB OH. Robert A. Lee, branch chief, was the technical monitor for the effort.

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1 Introduction

The Noise Data Acquisition and Display System (NDADS) is an interactive tool for the user-enhanced automation and creation of flight tracks and profiles for noise analysis based on radar tracking data. The NDADS system features graphical methods for the rapid creation of vectored flight tracks with statistical guidance via gate penetrations and visual references based on background maps. Profiles, including altitude, velocity, and power, critical for the evaluation of noise contours, may also be generated easily. The NDADS system contains a suite of pre-processors for the evaluation and subset selection of flight tracks, and profiles based on radar data. Reports and statistical analysis features provide operational summaries and airfield utilization information as well as statistical track modeling capabilities. NDADS generates files which may be read directly into the NMAP Noise Analysis system. This document describes the NDADS system and instructs the user towards the development of aircraft flight tracks and profiles.

The modeling of aircraft noise exposure due to flight operations around airfields begins with the collection of operational data. This information can be categorized as follows:

- Operational statistics (including time and frequency)
- Flight track ground path
- Flight track climb, velocity, and power profiles
- Equipment utilization (engine/airframe combination)
- Ground run-up and maintenance operations

Historically, operations were collected from Air Traffic Control (ATC) in the form of flight strips, Air Traffic Activity Reports, Air Traffic Activity Analyzer Data, etc. Until recently, flight ground tracks, profiles, and power schedules were obtained from interviews with ATC and airfield operations personnel. The gathering of operations data and the conduct of interviews are labor intensive. Furthermore, tracks, profiles, and operational statistics are somewhat

dependent on the persons from whom the information is obtained and the interviewer. These variables can compromise the accuracy and integrity of the resultant aircraft noise exposure calculations. Pioneering noise studies demonstrated the feasibility of using actual radar tracking data as a reliable source for operational information.[1,2,3,4] NDADS[5,6] has been developed to allow the rapid and accurate preparation of operational data by analyzing actual radar tracking data for the purposes of noise exposure calculations around airports. The NDADS system utilizes an interactive graphical interface and user-enhanced automation, allowing the analyst to visually and mathematically create flight trajectories, both tracks and profiles, backbone and spread histograms, and to obtain accurate operation counts, frequencies, and distributions.

An incident report analysis feature, present in NDADS Track selection, is based on a user-defined time window, subset-selection criteria, and location (latitude and longitude, RAT coordinate system, or graphically via a mouse click). The tracks meeting the specified tolerances are graphically highlighted. Detailed information about the individual tracks (flight number, aircraft type, position, speed, etc.) is displayed in data tables.

NDADS requires an IBM-compatible PC with 256-color VGA monitor capable of supporting 1024x768 pixels in graphics mode with either the Windows 95/98 or Windows NT operating system. Disk space requirements for the program executable and run files are approximately 1.5 Megabytes. Radar data, track and profile files, and input configuration storage space are controlled by the user.

The NDADS system works with a project oriented directory approach. All associated data with the exception of radar data, are to be stored in one directory. The radar data may be stored in alternate directories or on CD-ROM or other operating system supported digital media. The initial Project Screen (Figure 1) allows the user to name the given project and assign default filenames or alternatively select files via a browse utility or keypad entry. NDADS Version 3, supports NMAP 5 and NMAP 7 formats. Configuration inputs – runways, navigation aids, specific points, and monitor location details – are contained within the Area Input File.

The actual radar data read by NDADS is in the form of RAT files. This standardized compressed binary file format has been chosen to isolate NDADS from any installation-specific radar hardware and software concerns. A suite of pre-processors for creating RAT

files has been developed for the ARTS IIIA[6,7,8] and PDIP[9] systems. Radar data is displayed graphically, superimposed on a background map in order to provide visual references when analyzing and creating flight tracks. The NDADS tracking display options utilize an interactive, user-defined color palette and include a variety of label and color controls including

- Label and color tracks by aircraft type
- Track color by operation type
- Color by day/evening/night
- Color tracks by altitude
- Color tracks by velocity

The NDADS system also includes a suite of RAT manipulation tools for merging, splitting, viewing, summarizing, and manipulating RAT files. Additionally, subset RAT files may be saved to disk from within NDADS to allow for multiple user parallel processing for large volumes of radar data. An additional feature, the ability to display *.PCX format files as a background, makes possible the rapid generation of flight tracks, from radar data (or other sources) available only in hardcopy format. A mouse pointer, which displays location information in a myriad of units, permits rapid alignment of radar origins, background maps, and runways.

2 Data Analysis Philosophy

When working with radar data, an analysis strategy for creating flight tracks, profiles, or operational statistics must be developed. Data may be filtered using the following independently controlled sorting and subset selection parameters:

- Aircraft type
- Runway use
- Operation type
- Operation Time (day, evening, night)
- Proximity calculations (gate penetrations)

Two suggested operational strategies for filtering and processing radar data are listed below. Both strategies for subdividing the raw radar tracking data yield subset RAT files and hence permit multiple analyst work.

1. Create several large gates near the outer perimeter of the radar coverage area to break traffic into subsets each containing tracks bundled into different general directions. Working with a subset from Step 1, create smaller gates in methodical fashion, working from the outside in towards the center, near the airfield. Then proceed to subdivide each subset into "related" sets, by aircraft type, maneuver type, runway usage and so on.
2. Initially subdivide the operations into "related" sets, either aircraft type, maneuver type, operation goal, runway usage etc. One must consider the fleet mix, as well as the nature of the operations and missions utilized by the specific installation. Then, develop bundles of tracks using an outward to inward gating procedure as described above.

2.1 Gates

Gates are windows in the 3.0 radar coverage area defined by two endpoints in the ground track plane, accompanied by minimum and maximum altitude limits. Gates are interactively drawn by clicking the mouse on the gate endpoints. Gate endpoints may also be typed in via a form. Gate status is boolean, toggled by the user, and may be ON or OFF. Once a gate has been created, the user may direct NDADS to calculate which radar tracks "fly through" or penetrate the gates. Only tracks and gates which are turned ON will be considered in the analysis. Logical and/or patterning is determined by a combination of the number of filtering steps and the specific sequence. Within a particular filter criterion – for example, aircraft type – NDADS will perform an OR operation selecting, for example, tracks which are F16 or F15 aircraft types. Boolean AND operations occur between the filter criterion types; for example, F15 AND Runway 08. Successive gate penetration calculations provide an AND operation, whereas the OR operation is obtained within a single gate penetration calculation. Once a final group of related tracks has been defined and selected, the user may create a subset RAT file. Then using this smaller file, the user will proceed to calculate track statistics and create flight paths and profiles in preparation of the noise analysis.

2.2 Ground Tracks

Flight ground tracks within NDADS may be defined either as vectors or points. A vector analysis in lieu of a point-to-point approach is currently required by NMAP and utilizes discrete noise prediction methodologies for straight and curved segments. NDADS has incorporated vector procedures for straight and curved segment drawing into its graphical definition process. Alternate noise prediction models contain the ability to input point to point tracking data and NDADS also supports this track modeling structure. Generally, the vectored track approach is preferred because raw radar tracking data contains a certain degree of inaccuracy given radar system resolution limitations and the reality of transponder interference clutter. The NDADS RAT file pre-processors contain radar data smoothing algorithms for minimizing such discontinuities in the flight tracks and profiles.

For guidance with drawing vector tracks, NDADS calculates and displays mean and standard deviation gate penetration locations. Creating a series of gates along the flight paths encompassing the subset of tracks being studied will guide the user in the statstical

production of a series of vectors for the backbone based on track targets. The user must decide how to best model the tracks for the task at hand. This location of vector targets is judgmental and dependent on the following factors:

- Subset selection criteria
- Radar track dispersion
- Geographic concerns
- Operational criteria
- Desired model accuracy

Vector tracks are drawn within NDADS beginning on the runway (this is true for departure, arrival, and closed patterns) and are required to start with a straight segment. During the track drawing process, the status box indicates the track position, heading, and length based on the RAT file coordinate system. Exact values may be entered via forms. After the initial straight track vector has been created, the user may draw a curved segment. The screen cross-hair points to the end of the curved segment. As the mouse is moved, the screen is updated interactively with a circular segment, which is tangent to the previous segment and ends at the mouse location. For visual guidance and help aligning curved segments with the vector targets, an infinite straight segment is ghosted at the end of the curved segment at the current ending heading angle. The entire curve and straight segment are interactively updated as the mouse is moved. At any time, the right mouse button may be clicked to view or type in the segment values. Upon completion of a track, the user may input various descriptors and names, and save it to disk in the specified format. Full control over tracks by reading in, displaying, and editing is provided within the NDADS environment. The ASCII format nominal track files may also be easily manipulated with text editors or other software. NDADS has the capability to perform track proximity statistics including gate penetration reports and histograms, as well as backbone and track distribution calculations for use by the noise analysis tools. An ASCII report format is supported for the rapid postprocessing, statistical analysis or incorporation into user documents (see Appendix B).

2.3 Flight, Velocity, and Power Profile Manipulation

The NDADS system encompasses a suite of flight and power profile analysis tools. One of the strengths of NDADS is the ability to develop and manipulate the flight profiles from radar data. In this report the term flight profile refers to the altitude, velocity and power profile as a group. As with the flight track creation process, it is the user's obligation to appropriately group together flights with a similar focus before creating the NMAP profiles. While NMAP treats the tracks and profiles independently, NDADS with radar data has a built in link between the two. As one subdivides the radar data the user should also consider the vertical profiles of the operations. Vertical data may be viewed in NDADS from profile mode. After an appropriate subset of tracks has been gathered together, the profile creation process may begin.

The Climb and Throttle Scheduler (CATS) code (currently under development) is one of several NDADS stand-alone utilities and will be described in more detail in the future CATS code User's Guide. It should be exercised prior to running NDADS if powered RAT files are desired; however this is not required. Power Profiles may still be created in the absence of power data in the RAT files. The methodology for creating power data from radar tracking data involves the prediction of basic engine pressure ratio (EPR) or N1 levels, a measure of the engine operating state for each segment in the flight profile. These nominal engine operation levels are determined based on detailed airframe / engine performance data as well as base-specific operational and procedural information. These throttle settings are then applied to the actual radar track flight profiles with transition segments and changes guided by geometric profile inspection, and actual aircraft performance parameters as a function of the true trajectory. As with the track analyses, an overall profile building analysis strategy should be developed. Care should be given while performing subset selections to ensure that aircraft with similar performance ability are used for generation of profile statistics. A vertical gating procedure has been implemented in NDADS3 for the creation of climb, velocity, and power profiles. It is important to consider the noise analysis procedure, which links the tracks and profiles together at this point in the study to ensure that tracks representative of nominal operations are used to create the profiles. Classes of profiles can be readily created by subset selecting various combinations of input tracks. The interactive profile drawing process accounts for the linked altitude, velocity, and power distance break points inherent within NMAP. It permits user judgment for appropriate placement of curve breaks via an

interactive vertical position bar. This indicator, present on all three profile graphs, is moved simultaneously in the lateral direction as the mouse location is changed. As with the tracking mode, a series of vertical gates and statistical targets may be created for mathematical guidance of segment breakpoints. NDADS has the ability to link profiles with track points interactively. As the mouse cursor is moved in the lateral direction, a position locator is displayed on the track in the track view plot. This feature is extremely useful for pilot visual throttling realities, track-specific profile considerations, or other case-specific concerns. To allow easy repeatability, all data values may also be entered via forms. Profile maintenance capabilities, including reading in and editing prior profiles, either from NDADS NMT or FPR files, or from NMAP BPS files, are supported by NDADS.

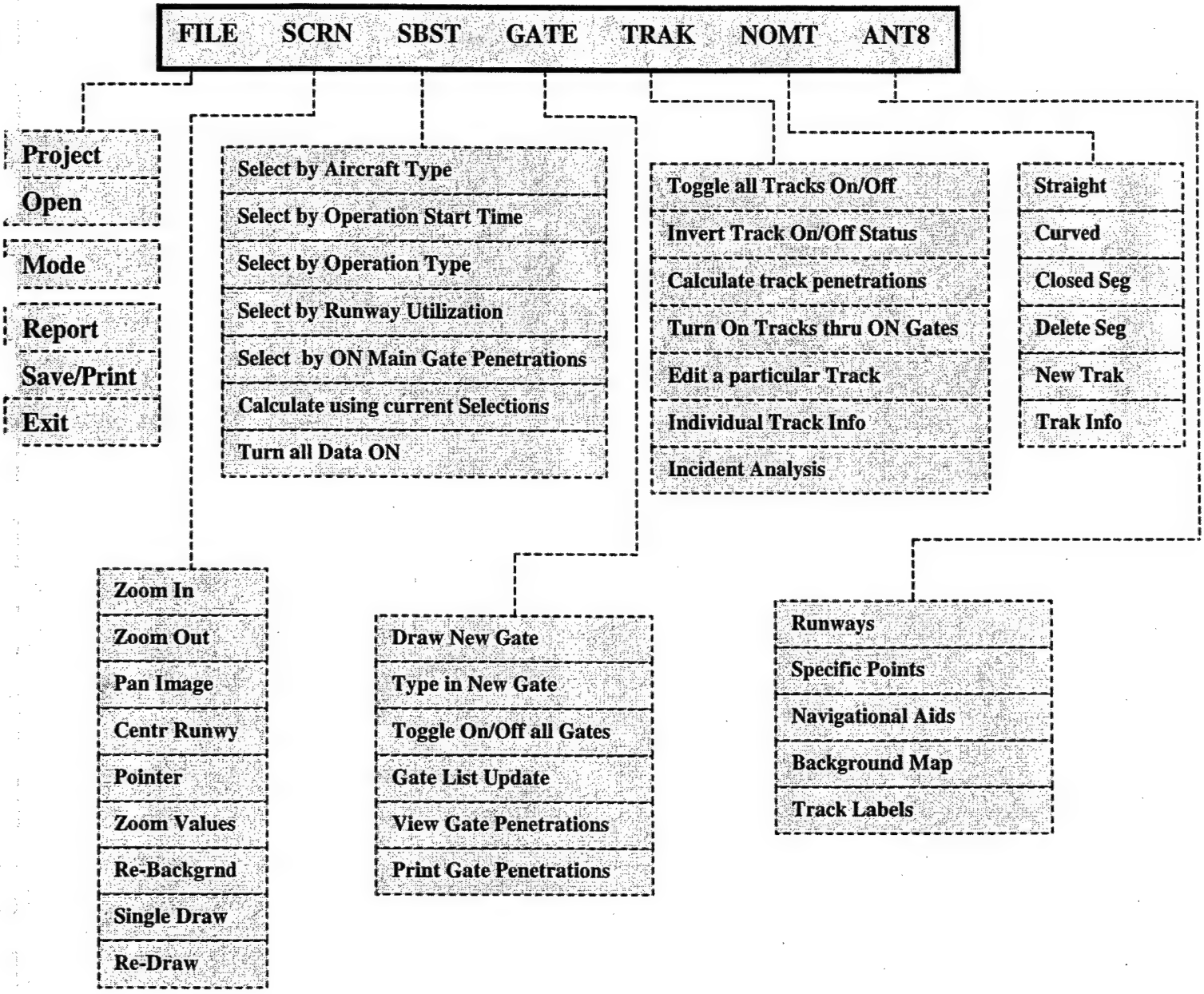
2.4 Operational Data

Operational statistics comprise a major portion of data gathering efforts for the purposes of noise analysis. Several summary reports and statistical analysis tools are provided within NDADS. Operation statistics including aircraft type distribution and runway utilization are readily and accurately created based on actual radar tracking data. Scaling parameters such as daily, weekly and monthly, for the purposes of obtaining annual operation summaries are under the user's full control. Within the NMAP BPS and OPS files, operational counts are linked to the flight profiles. As such, after a particular selection of flight tracks has been made, the user may "count" the radar tracks to obtain operational count data.

3 NDADS Tutorial

This section of the manual will walk the new user through a sample analysis using the supplied SHAW96 radar data contained on the NDADS3 distribution disk. This chapter is targeted towards the new NDADS user, but one who is familiar with noise analysis via NMAP. Keep in mind that NDADS is a tool that can be used to process the data based on the user's need and as such there are numerous paths one may follow to process the radar data. Only one method is presented here with the primary intent of familiarizing the user with the basic features in NDADS. An overview of the structure of the NDADS menu heirarchy is given in Table 1.

Table 1. NDADS Menu Structure



3.1 Starting NDADS

After installing NDADS (see Chapter 4), NDADS can be run from a Windows®-aware DOS prompt, by double clicking on NDADS3.exe, or by clicking on the NDADS icon on the desktop. To run NDADS from the DOS prompt, go to your directory where the sample files are located. Type in NDADS and press RETURN. The PROJECT SCREEN, Figure 1, will appear. The Project Screen contains three types of fields:

1. *Informational Fields:* Black text written on the grey background. These fields may not be edited.
2. *Input Fields:* Indented areas within which data may be entered or modified. The user may enter an editable field by repeatedly pressing the TAB key or by directing the mouse cursor over the area and clicking the left mouse button.
3. *Buttons:* Buttons may be activated by clicking the left mouse button on them. Buttons are used throughout NDADS to perform operations, confirm user selections, or as gateways to other input and informational screens.

The project suite name serves as a default filename builder within NDADS. Enter the projet name (SHAW96 for the distributed sample case) in the project suite name input field and then click on the BUILD NAMES button. All the default project filenames with the expected extensions will automatically be generated. There is always the option of using different file names for your reference. Any filenames contained in the input fields will be overwritten with the default names. It is suggested that the BUILD NAMES button be used immediately upon entry into the PROJECT SCREEN, before using the BROWSE button or manually typing in any filenames. Individual filenames and file extensions may be manually edited by tabbing or mouse clicking into the appropriate field and using the delete, backspace, and keyboard keys. All valid 60-character Win 95/98/NT filenames with 3-character extensions are permitted.

The BROWSE button may also be used to update the Project Screen. Clicking on the BROWSE button will produce the OPEN FILE SCREEN, Figure 2. The file type is specified by selecting one of the extensions in the File Type button. More details about the specific file types and data structures may be found in Chapter 5.

When using the BROWSE button, the fields in the PROJECT SCREEN are automatically updated. Extensions other than the defaults must be manually typed by the user in the appropriate PROJECT SCREEN field. Once all the appropriate filenames have been defined, clicking on the OK button opens the MAIN MENU and displays the radar tracks superimposed on the background maps. Selecting CANCEL from the PROJECT SCREEN at this initialization point aborts program execution. Once the project files have been properly identified and NDADS has been initialized, the Radar Track screen, Figure 3, will appear. To cancel screen redrawing or data processing, use the ESCape Key at any time throughout NDADS.

3.2 Data Filtering

The next step is to filter the data by specifying multiple selection criteria. This will eliminate unnecessary tracks allowing the user to focus on specific data sets. In this working example, we choose the F-16 aircraft, departing on runway 04L of the Shaw96.RAT data file.

We proceed to the aircraft type subset by choosing <Sbst> - < Select by Aircraft Type> from the menu bar. Within this menu all aircraft types present in the radar tracking file are displayed and initialized to ON. From the aircraft type selection window, Figure 4, select <ALL> to toggle all aircraft types OFF and then click ON the desired aircraft type(s). In this case the F-16 is chosen and clicked ON.

Consistency with the noise prediction codes capabilities dictates a breakdown into three time groups as shown in Table 2. The user has the option of filtering the data by operation start time using the subset option <Select by Operation Start Time> as shown in Figure 5. Using the ON/OFF selection key next to every operation time set, the user can filter out operations that occurred during a certain time range. In this working example there will not be any data filtering by time constrains, therefore the user needs to toggle all buttons to the ON position and then press <EXIT>. This will reassure none of the given operations are filtered by time constrains.

Table 2. Day / Evening / Night Time Definition

Period	Start Time (Greater Than or Equal To)	End Time (less than)
Day	07:00	19:00
Evening	19:00	22:00
Night	22:00	07:00

Within NDADS local time is used. The input RAT file contains all necessarry information for converting from Zulu or other radar system time to local time.

Next, the user should select the operation type. The radar screen shows all departure, arrival and closed patterns. The selection of operation type is shown in Figure 6. This working example case is concerned with the departures; therefore the departures are turned ON, whereas the arrivals and closed patterns are turned OFF. See Chapter 9 Subset Selection Utilities for more detailed discussion about the filtering options. After finishing the selection procedure click on the <EXIT> key to continue.

The next step is sub-grouping the tracks by runway utilization. This option allows the user to filter out operations based on runway utilization criteria. The <Select by Runway Utilization> screen, shown in Figure 7, displays a list of the available runways within NDADS and their selection status. In this case runway 04L is chosen and therefore all operations performed on the unselected runways are filtered out and also removed from the screen.

Up to this stage the data was filtered by F-16 aircraft type, departing on runway 04L. Once all the necessary subset selections have been made, the user needs to click on to the <Calculate using current Selections> of the subset menu window and NDADS will then go through the radar tracking data and evaluate which tracks meet the specified filter requirements. Only ON tracks are considered in the analysis, therefore it might be necessarry to first <Turn all Radar data ON> before <Calculate using current Selections>. After processing the RAT file, the radar track screen, Figure 8, filtered radar data is automatically refreshed and only F-16 departures from runway 04L are displayed.

3.3 Graphical Maneuvering within NDADS:

All graphical manipulation of the radar view are performed through the screen control menu. All the items on this menu control fundamental display parameters, the basic lower left and upper right coordinates, and the actual screen display itself. What follows here are descriptions of the most frequently used screen view operations. See Chapter 8, Screen Control Utilities for a complete listing of all features.

- ZOOMIN: Draw a rubber-banded zoom box around the desired area by clicking the mouse on one corner and then dragging the rubber-banded box to the opposite corner and fixing it with a second mouse click. The proper aspect ratio in order to preserve a 1:1, x:y ratio on the track window is automatically maintained on redraw.
- ZOOMOUT: This doubles the window size. The current screen center is maintained and the X range and Y range of data displayed on the RADAR TRACK SCREEN are doubled.
- PAN IMAGE: This menu requires a mouse click at the new screen center location. The lower line of the NDADS MAIN MENU displays mouse and real-world units information.
- CENTER RUNWAY: This routine restores the zoom and pan coordinates such that the display area is centered on the runways with horizontal extent displayed up to 100,000 feet.

3.4 Drawing Gates:

The user should aim to bundle similar flight tracks together. From the radar screen it can be seen that in this case example, there are two similar groups of tracks. We are going to bundle together two individual groups of tracks by using gates. Gate #1 intercepts all tracks heading east and south east and Gate #2 is drawn to intercept all tracks heading north and northwest. To draw a new gate, move the mouse to one endpoint location of the gate. As the mouse moves, location information is displayed in the status box in the MAIN MENU. The X, Y values displayed are in the RAT file radar coordinate system. The length of the gate, in the same units, is also shown and interactively updated. A mouse click fixes the first endpoint of the gate. Move the mouse to the other gate end point. A gate line will be interactively updated as the mouse moves. Another mouse click fixes the

second (XY) location of the gate. The GATE DATA UPDATE TABLE, Figure 9, will now be displayed. A minimum and maximum altitude range, in feet Mean Sea Level (MSL) of 0.0 and 35,000 feet respectively is in the form by default; however it may be updated by clicking on the desired field and typing in the new value. For this tutorial the upper limit should be reduced to 10,000 feet. The ON/OFF gate status is indicated via the button. The default when creating a new gate is ON; however, depressing the status button may toggle it OFF. Repeat this process and create Gate #2 capturing tracks heading towards the northwest as shown in Figure 10.

3.5 Gate Penetrations

Now that Gate #1 and Gate #2 have been defined, we need to calculate the gate penetrations for each gate. Use the <Calculate Gate Penetrations> option in the gate pulldown menu. NDADS will then calculate which tracks penetrate which gates as well as calculate the mean and standard deviation of the gate penetration in horizontal and lateral directions for every ON gate. One can see a circle centered at the mean X, Y location value with its radius defining 1 standard deviation of all ON tracks that are penetrating that specific gate (Figure 10). The view gate penetration window is a useful tool that allows the user to visualize a cross section of the gate window. In order to do that; select <Gate> - <View Gate Penetrations> as shown in Figure 11, and click on the <calculate> button. The cross section window will show the gate penetrations relative to the mean track location point, which is located at the center of the window, Figure 12. It is the user's responsibility to maintain the cross-reference list by explicitly calculating track penetrations when changes, additions, or deletions to the gate have been made. A true 1:1 distance: altitude ratio is maintained. The lower and upper altitude limits are shown within the window. The cross hair drawn at the penetration chart window represents one standard deviation of the track penetration in the length and height directions. Additional information for manipulating and viewing gates and gate penetrations, and for generating gate penetration reports can be obtained in Chapter 11, Gate and Vertical Gate Utilities.

3.6 Developing Nominal Track Targets

The previous steps created meaningful subsets of radar track data to prepare NDADS for creating Nominal tracks. The intent of this step is to create a series of target gates, each with a statistical penetration target that will guide the track drawing process. Ultimately the radar track bundles are replaced by stastically valid backbone vectored tracks. In this tutorial we are going to draw two Nominal tracks; one for each track bundle. Repeating the steps in Section 3.4 and 3.5 create a series of gates for each track bundle as shown in Figure 13.

3.7 Drawing Nominal Tracks

The Nominal track drawing process is and interactive graphical process consisting of straight and curved segments strung together. Each nominal track must begin with a straight segment aligned with a runway of the user's choice. All tracks going through Gate #1 are F-16 departure tracks from runway 04L heading east and southeast. Therefore the Nominal track should be an F-16 departure from runway 04L heading somewhere between east and southeast.

3.7.1 Straight Segments

Click onto <Nomt> - <Straight>. This selection will open the Runway Selection Table, Figure 14. The user should identify runway 04L and toggle its status to ON. After the runway has been identified, click onto the <OK> and the Operation Selection Window, Figure 15, will appear. The user should choose the operation type of the nominal track, departure in this case, and click on <EXIT>. Note that the buttons on the Operation Selection Window are automatically linked so that only one penetration type may be selected at a time.

After choosing the operation type, the straight segment drawing process begins, at which a straight segment, beginning at runway 04L, ending at the mouse cursor, is drawn. At any time the right mouse button may be clicked to open up the Straight Segment Input Form. The user may alternatively type in the segment length and press <OK> as shown in Figure 16. A mouse click will define the end of the segment. The aim is to replace the bundle of tracks penetrating Gate #1 with a new nominal track.

The center of the statistical track target circles is to be used as the main guideline for drawing the curved segment.

3.7.2 Drawing Curved segments:

The option for drawing a curved segment is under <NomT> - <Curved>. The cross hair points to the end of the curved segment. As the mouse is moved, the screen is updated interactively with a circular segment, which is tangent to the previous segment and ends at the mouse location. An additional straight line extends off the end of the screen. The straight segment tangent to the end of the curved segment displayed during the drawing process may be used to guide the curved segment endpoint location while considering a potential succeeding straight segment. During the process the status box displays the radius of the segment in the initial RAT file, the initial heading angle of the segment and the length of the curved segment. The selected final segment is registered into memory by clicking the left mouse button.

As in the straight segment creation the right mouse button may be clicked to alternatively type in the curved segment Radius and Heading. This feature is particularly useful when creating closed patterns and touch and go maneuvers where changes in heading must exactly add up to 360^0. The Nominal track will consist of straight and curved segment combinations. Complex curves may be obtained by drawing curves of varying radii in sequence.

3.8 Vertical Gates:

The vertical gate utility allows the user to proceed a step further in analyzing the radar data. The vertical gate utility is accessible when NDADS is in profile mode. To get to the profile mode, click on <FILE> <MODE>, and the operation mode screen (Figure 17) will appear. Turning the <Profile> button to the ON position and clicking on the <Exit> button will set the program to the profile mode and refresh the screen. The first time into profile mode, NDADS scans the RAT file and determines appropriate axis limits for the plots. The escape key may be used to prematurely cancel the file scan or screen redrawing process. The altitude, velocity, and power profile windows will appear on the right of the screen as shown in figure 18. The Altitude profile window displays altitude in feet (ft) versus arc length, S in kft. Within NDADS arc length is defined as the X-Y plane projected distance from the origin.

Similar to the gates drawn in track mode, are the vertical gates in profile mode. We proceed by choosing, <Vgt8> from the main menu window and click on <Draw New Gate> at which the vertical gate lower and higher altitude bound will be fixed by a mouse click respectively. In this example case, the vertical Gate #1 drawn bundles altitude profiles falling within the altitude range of 500 - 5000 ft at a distance S from the origin of 10,000 ft, and vertical Gate #2 bundles altitude profiles falling within the altitude range of 5000 - 12000 ft at a distance S from the origin of 50,000 ft as shown in figure 18. The next step is to calculate track penetrations through the vertical gates using the <Calc. Gate penetrations> from the <Vgt8> menu. The calculate option will draw a circle centered at the mean altitude with its radius defining a standard deviation of value 1 based on all profiles included within the gate range. Here we also define independent gates for the velocity and power profiles. All defined gate characteristics are based on profile similarities to enable the user to create meaningful statistical targets for creating nominal flight profiles from the available radar profile data.

3.9 Creating Flight Altitude, Velocity and Power profiles:

The nominal profile drawing option is accessed through the <Nomp> button in the main menu window. Choosing the <Add New Segment> the mouse pointer is set at the origin of the altitude profile window. As the mouse moves, arc length and vertical dimensional information are displayed in the status box. One can also see the interactively updated vertical bar in all three profile windows. This feature permits a visual judgement of appropriate breakpoints in the profile by considering all profile information at once. Additionally, if a single nominal track has been loaded into memory and is currently active, as the mouse moves in the horizontal location, a track location symbol advances along the nominal track displayed in the reduced-size radar track window. This visual cue is particularly useful when creating profiles whose information is directly linked to a given track, such as touch and go patterns.

Once the profile segment end point has been determined, a mouse click fixes the starting point of the first profile segment and the mouse pointer is automatically set to the velocity profile window. The S distance for all segment breakpoints are linked together as required by the structure of NMAPs profile definition. After the initial altitude is specified, either by a left mouse click in the appropriate location, or via an input form activated with a right mouse click, the mouse pointer is then set to the power profile window at the same S

location. This time the mouse is not permitted to travel horizontally, as the S location has already been fixed. Vertically, the mouse is not restricted. After the velocity point has been selected, the mouse automatically advances to the power profile window and the process is repeated. Selecting the appropriate power setting with the guidance of the gates concludes the profile segment definition. Even if a powered RAT file is not available, direct input of the power profile information is permitted. The initial segment, requiring two end points, requires two passes through this interactive drawing process. Subsequent segments add one more point to all three profiles, requiring only one pass. Select the <Nomp> button in the main menu window and choose the <Add New Segment> five times in order to create a nominal profile similar to the one shown in Figure 19.

After the profile has been completed, <File> and <Save> opens the Flight Profile Form and allows the saving of the particular profile information (altitude, velocity and power) to the FPR file. Data files to which the user can input information consist of the Profile ID, which may be any four-character identifier, the aircraft class, the Aircraft type if multiple aircraft types are currently selected ON, the flight track ID (any four-character identifier for a previously created flight track, though it need not match nominal tracks in the current NDADS session) and general profile comments. The structure of this file is that contained in NMAP BPS files. The FPR file may be assembled into an existing BPS file, or merged with other file segments using any text editor for creation of a NMAP input deck. Operational information contained on this form is described below, in Section 3.10.

3.10 Developing Operational Count Data

Within NMAP the flight profiles contain the vital link between flight track, climb, velocity and power profiles and operational count information. This structure is repeated within NDADS. After the profile has been created as described in Section 3.9, the operational statistical information may be generated. When the flight profile is saved via the <File> and <Save> options, the Flight Profile form is displayed (Figure 20). Clicking on the <COUNT> button allows NDADS to count all the currently turned ON operations in the RAT file, displayed in the radar screen and assess the day, evening and night time operations. The <SCALE> button allows the user to scale the radar data appropriately. If the given subset of one week of radar data is displayed in NDADS, then WEEK would be

selected in the scaling option form. Alternatively, the user may elect to manually enter the operational data in the form. Pressing on the <OK> button saves the profile to disk.

4 Setup and Installation

NDADS Version 3.0 is distributed with this manual on 3½-inch floppy disks in IBM PC format. The distribution disks contain two self-extracting zip executable files, INSTALL.EXE and SAMPLE.EXE. Table 3 itemizes the particular files contained within the zip executable files:

Table 3. Zip Executable Files

INSTALL.EXE Contains:	
courb.fon	Graphics Font File
general.smb	Graphics Symbol File
NDADS3.exe	NDADS V3.0 Executable
SAMPLE.EXE Contains:	
Shaw96.bps	Sample NOISEMAP BPS Ffile
Shaw96.cfg	Sample NDADS Configuration File
Shaw96.gt8	Sample NDADS Gate File
Shaw96.inm	Sample INM Input File
Shaw96.fea	Sample NDADS Background Map File
Shaw96.nmt	Sample NDADS Nominal Track File
Shaw96.rat	Sample NDADS RADAR Data File
Shaw96.xrf	Sample NDADS Cross-Reference File

The NDADS executable graphics files must be installed either in the working project directory or in a directory contained in the Windows path statement. To install the executable files, switch to the chosen directory, insert the NDADS disk, and type A:/INSTALL where A: is the name of your floppy disk drive. This procedure will extract the five files as described in Table 3. Now create or switch to a work or project directory and type A:/SAMPLE and press return. Again, A: is the name of your floppy drive. This procedure will extract the seven files as described in Table 3.

5 Specifying the Project Files

After installation (see Chapter 4), NDADS can be run from a Windows-aware DOS prompt, by double clicking on NDADS3.exe, or by clicking on the NDADS icon on the desktop. To run NDADS from the DOS prompt, go to your directory where the sample files are located. Type in NDADS and press RETURN. The PROJECT SCREEN, Figure 1, will appear. The Project Screen contains three types of fields:

1. *Informational Fields:* Black text written on the grey background. These fields may not be edited.
2. *Input Fields:* Indented areas within which data may be entered or modified. The user may enter an editable field by repeatedly pressing the TAB key or by directing the mouse cursor over the area and clicking the left mouse button.
3. *Buttons:* Buttons may be activated by clicking the left mouse button on them. Buttons are used throughout NDADS to perform operations, confirm user selections, or as gateways to other input and informational screens.

The project suite name serves as a default filename builder within NDADS. The BUILD NAMES button will generate all the default project filenames with the expected extensions. Any filenames contained in the input fields will be overwritten with the default names. It is suggested that the BUILD NAMES button be used immediately upon entry into the PROJECT SCREEN, before using the BROWSE button or manually typing in any filenames. Individual filenames and file extensions may be manually edited by tabbing or mouse clicking into the appropriate field and using the delete, backspace, and keyboard keys. As described earlier, all valid 60-character Win 95/98/NT filenames with three-character extensions are permitted.

The BROWSE button may also be used to update the PROJECT SCREEN. Clicking on the BROWSE button will produce the OPEN FILE SCREEN, Figure 2. The file type is specified by selecting one of the extensions in the File Type button.

Table 4 contains a list of the NDADS project suite default filename extensions and their meaning.

Table 4. NDADS Project Suite Default Filename Extensions

BPS	Baseops File: NOISEMAP BPS format file or file segment containing at minimum runway definitions. Navigational Aids and Specific Points may be accessed and displayed by NDADS on command.
INM	Input Deck: INM 4 input format file or file segment containing at a minimum the runway definition.
CFG	Configuration File: ASCII file containing the following coordinates in feet, each on a separate line: The linear offset between the BPS or INM runway coordinate system and the radar coordinate system. These numbers will be subtracted from the BPS or INM coordinates to yield RAT coordinates. The Ground Altitude, feet MSL, at the first endpoint of the first runway. Currently, NDADS contains no terrain algorithms. The lower left- and upper right-hand corners of the Radar Track screen relative to the radar coordinate system origin. This file will be created by NDADS and need not exist upon entry into the program.
RAT	The Radar Tracking file in RAT format. To run NDADS without any radar data, leave the RAT file field blank.
OUT	The new RAT filename in the event that RAT file data is modified by the user in some way. After generation of a new RAT file, it is the user's responsibility to maintain the filename convention (for example, renaming the file *.RAT if desired) and preservation of original RAT files.
GT8	Gate File: This ASCII file is created when Gates are drawn and saved. NDADS maintains this file itself and editing by the user is not necessary. This file will be created automatically by NDADS if a prior GT8 file does not exist.
XRF	Cross-Reference File: This ASCII file contains track and gate penetration information. User intervention is not required on this file. NDADS will create an XRF file if none exists.
NMT	Nominal Track File: This file is read and written, and either created new or appended to as necessary, by NDADS. It contains the nominal track information in either INM or BPS file format as dictated by the area input filename. The user may cut and paste this ASCII file as required. If no flight tracks are drawn and saved, this file will not be created if it did not exist, or modified if it was present.

Table 4 (Continued)

FPR	Flight Profile File: This file is read and written and either created new or appended to as necessary by NDADS. When operating in BPS mode, it contains flight track and power profile identifiers and operation counts. When operating in INM mode it contains altitude, speed, and thrust information.
FPW	Flight Power Profile: This file is only used when operating in BPS mode. It generates the altitude, power, and velocity information for the profiles as drawn by the user in NDADS.
FEA	The NDADS background file in standard *.FEA format. A background file need not be used.
PCX	The PCX file to be displayed as the background in NDADS. This can be anything the user desires. It is the operator's responsibility to generate PCX files in such a manner as to maintain a true 1:1 ratio in the horizontal and vertical directions, as PCX files are not scaleable within NDADS. A background file need not be used.
LST	Output Listing File: This ASCII report file is generated by NDADS and contains such information as RAT file operation counts, gate penetration statistics, aircraft type, and operational breakdowns. This report file is created new or appended to as directed by the user.

When using the BROWSE button, the fields in the PROJECT SCREEN are automatically updated. Extensions other than the defaults must be manually typed by the user in the appropriate PROJECT SCREEN field. Once all the appropriate filenames have been defined, clicking on the OK button opens the MAIN MENU and displays the radar tracks superimposed on the background maps. Selecting CANCEL from the PROJECT SCREEN at this initialization point aborts program execution.

If a non-BPS format area input file is being used, the MAGNETIC DECLINATION SCREEN opens, and the user is prompted to input the angle, in degrees. Application of this angle translates the expected true coordinates as defined in the Area Input file to the expected magnetic coordinate system of the RAT file via the following formulae:

$$X_{NDADS} = (X_{area} - X_{offset}) * \cos(\alpha_{area}) + (Y_{area} - Y_{offset}) * \sin(\alpha_{area})$$

$$Y_{NDADS} = (Y_{area} - Y_{offset}) * \cos(\alpha_{area}) - (Xarea - X_{offset}) * \sin(\alpha_{area})$$

where: AREA denotes as defined in the Area Input File,

OFFSET denotes as defined in the Configuration File, and

NDADS denotes the internal coordinate system which should align with the RAT file coordinate system.

When using graphics image files as backgrounds within NDADS, either PCX (PC Paintbrush) or Uncompressed BMP format files may be loaded. The nearest available screen mode, which matches the contents of the file will be used within NDADS. The image will be justified in the lower left corner of the screen. If it is too large to fit on the screen, the bottom left corner is displayed. Any palette information contained within the background file will override the NDADS initialization, possibly causing display problems. It is therefore recommended that only 256-color 1024x768 graphics images are imported into NDADS.

6 The Radar Track Screen

Once the Project files have been properly identified and NDADS has been initialized, the RADAR TRACK SCREEN, Figure 3, will appear. This contains a 1024x768 pixel area where the selected background file (if any) is displayed and any available RAT file data is superimposed. Runways are contained within the FEA file and are displayed in pink. If an alternative background format (e.g., PCX or BMP) has been selected, it is the user's responsibility to incorporate the runways into that file for display purposes. NDADS does not separately draw runways by default. They may be explicitly turned on by selection ANT8/Update Runways (see Chapter 14). Within NDADS3 this window may be scaled, resized or maximized to suit the user's needs. However, graphics are updated each time a window resize event occurs only if a text form is not active.

As specified by the FEA file format, the roads are drawn in grey; rivers, streams and lakes in blue; and runways and airfields in magenta. Upon entry, all navigational aids and specific (BPS format Area Input files only) points are turned off.

If the XRF file does not exist on entry into NDADS, by default all tracks are turned ON and displayed in altitude coloring sequence; otherwise, track status is ON and OFF as specified in the XRF file.

The lower left corner of the screen displays a scale bar for gauging distances. The top left portion of the screen contains the MAIN MENU and an indicator of the operational mode status. The bottom line of the MAIN MENU, the STATUS BOX, is used to display processing, informational data, and error messages. There are seven buttons contained in the MAIN MENU. Each button actuates a pull-down menu grouped by functionality.

Tables 5 and 6 contain the overall function hierarchies when operating in TRACK mode and Profile mode, respectively. Each pull-down menu associated with the seven buttons is described in the following seven chapters.

Table 5. Function Hierarchy for Track Mode

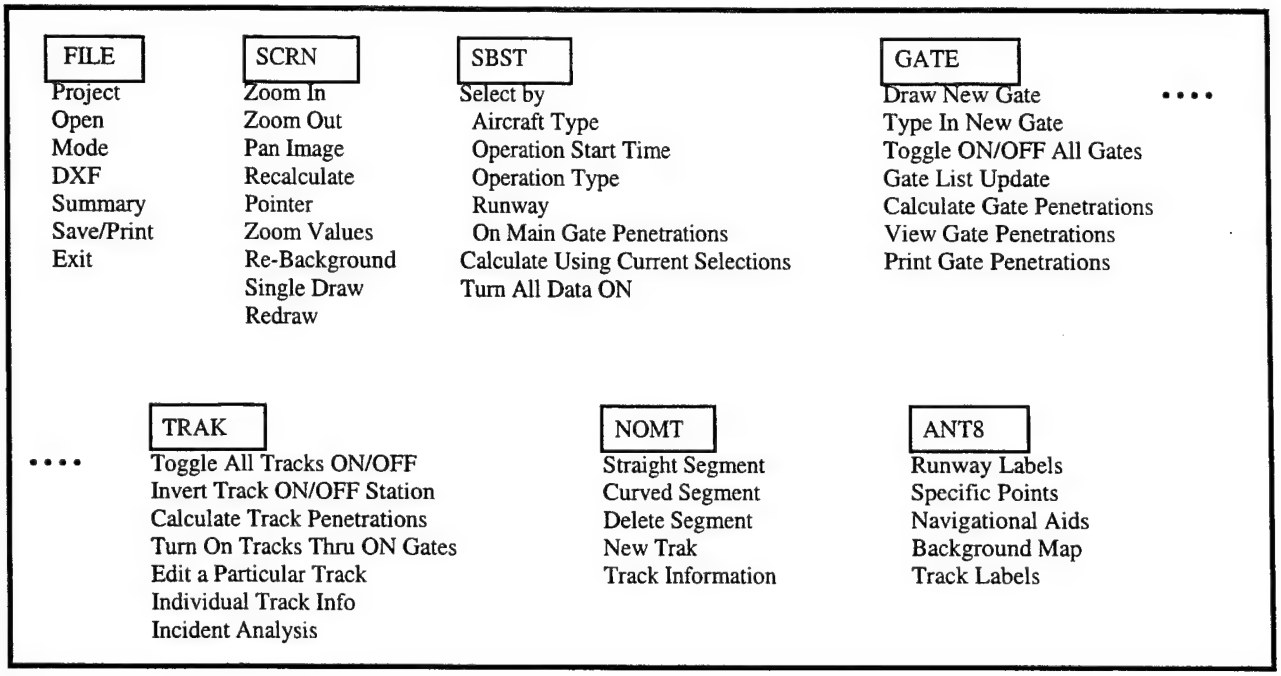
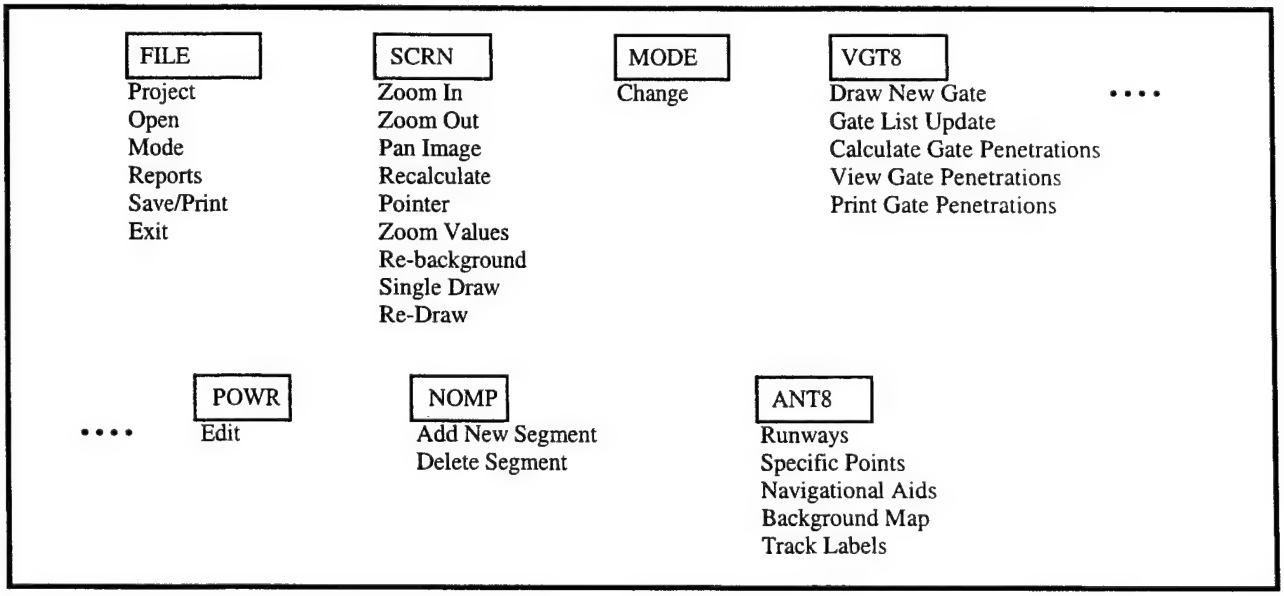


Table 6. Function Hierarchy for Profile Mode



7 File Management Utilities

Seven options as described in Tables 5 and 6 are available within the File Manager Menu:

- PROJECT: This opens the PROJECT SCREEN (see Chapter 5). At any time during program execution, the user may update filename information associated with the project. If the display data (background maps or radar data) is changed, it is the user's responsibility to manually Re-Draw the screen data (see Chapter 8). Configuration information, the Area input file, and Configuration file may not be changed after program execution has begun.

- OPEN: This feature, the OPEN FILE TABLE (Figure 2) allows the user to read in and overlay data on the existing RADAR TRACK SCREEN. Permissible file types are: RAT OUT, GT8, XRF, NMT, FPR, FPW, NDD, PCX, and LST. The other file types (BPS and CFG) may be selected; however, they will have no effect since the data has already been read into program memory. Attempting to use the OK button with an invalid file type will display the following message: "OPENITUP: Impermissible file". User-selected operation requires shutdown and re-initialization of NDADS. All file types may be BROWSED; however, either select a permissible file extension before depressing the OK button, or use the CANCEL button.

  To open up a previously created nominal track or profile and overlay it on the current screen, select the appropriate file extension and filename from the OPEN FILE TABLE and press the OK button. Depending on the filetype, the appropriate form for viewing the input file and selecting the input data will be displayed.

  *.NMT Files: The NOMINAL TRACK FORM (Figure 21) is used to select the nominal track for screen display. The Track No. Button activates a pull-down menu from which the desired track may be selected. The other fields in the form – Track ID, Runway ID, Track Type, #Segments, Track Definition, and Track Comments – are automatically updated. Clicking on the Nominal Track

Definition button opens a mouse/arrow-activated scrolling window containing the full track definition. Only a partial definition is shown on the NOMINAL TRACK FORM. Likewise, the Track Comment button activates a mouse/arrow activated scrolling window containing the full Track comments. The escape key closes each of these windows. The active runway may be changed for incoming nominal tracks by depressing the runway button. From the RUNWAY SELECTION TABLE (see Figure 14 and Chapter 14), turn ON the desired runway for screen display. To enter the nominal track into memory for processing and editing, select SAV. To simply display all tracks contained in the NMT file select the ALL ON button to toggle them ON or OFF as required. To display the selected track(s), press OK, or use the cancel button to exit the NOMINAL TRACK FORM. Tracks read into memory may be edited or appended to using the nominal track drawing options. They may also be output and saved.

*.FPR Files: The FLIGHT PROFILE FORM (see Figure 20) is used to select the flight profile for screen display. The Profile No. button activates a pull-down menu from which the desired profile may be selected. The other fields in the form, Profile ID, Profile Type, Aircraft Type, Aircraft Code, Flight Track ID, Runup Time (seconds), and Power Units are automatically updated. Clicking on the Profile Definition button activates mouse/arrow-activated scrolling window containing the full profile definition. Only a partial definition is shown on the FLIGHT PROFILE FORM. Likewise, the Profile Comment button activates a mouse/arrow-activated scrolling window containing the full profile comments. The ESCAPE key closes each of these windows. To display the selected profile, select OK, otherwise use the CANCEL button. The last profile read in now resides in memory and may be edited or appended to use the flight profile drawing options. They may also be individually output and saved.

*.DXF files: This option allows the creation of a DXF Background and Radar Track file which may then be plotted using third-party software. When entering the DXF OUTPUT SCREEN, the screen is refreshed and the specified file created. Caution must be used since exercising the ESC key to cancel track drawing to the screen will also have the same effect on the output DXF file.

Only the background NDD file and Radar Tracks will appear in the DXF files. Other format background files will not be output to the DXF output file. The user must enter a new filename. Appending to or overwriting prior DXF files is not permitted.

- MODE: This menu option is the gateway to the Profile information. The OPERATION MODE SCREEN (Figure 17) contains two buttons, Track and Profile. When one is ON, the other is OFF. Click on either button to toggle between Track and Profile modes. When working with radar tracks, gates, and nominal tracks, the Track mode must be used. Profile mode (Figure 18) should be used with altitude profiles, velocity, and power profiles. After selecting the OK button, with Profile mode ON, NDADS will prompt the user to enter the POWER WINDOW AXES LIMITS if no power data is contained in the RAT file. Minimum and maximum values default to 0.0 and 1.0, respectively; however, any values the user desires may be utilized. Select the OK button for the values to be applied. The screen will automatically refresh after changing the MODE of operation.

- REPORTS: This option enters the REPORT screen (Figure 22). Within this screen the user may select from several summary reports. Output reports can be written to user-specified file names in either append or overwrite mode. These output reports are ASCII files containing operation, statistical, and track and gate information based on the current project and track and gate settings. "Processing" appears in the bottom line of the MAIN MENU during data analysis. After completion, the if option to list? the ASCII file on the screen is selected YES the file will be displayed for viewing within NDADS. The up and down arrows, the Page Up and Draw key or the mouse may be used to scroll through the file. ESCape closes the file and returns to NDADS. Sample report files are given in Appendix B.

  RAT SUMMARY Report:

  OPS SUMMARY Report: This summary text file contains all available operations information based on the current SUBSET ON/OFF Cross-Reference selections in the XRF arrays in memory. Also referenced are the current ON gate definitions. The subset Selection criteria as well as the ARTS filename are listed in the output file. The tabulated data includes all SUBSET ON flight tracks:

1. Total number of flight tracks containing data
2. Total number of flight tracks containing two or fewer points
3. Total number of flight tracks by aircraft type
4. Total number of flight tracks by Day/Evening/Night
5. Breakdown of flight tracks by AC type and time
6. For ON Gates, total number of flight tracks by AC type and time
7. The CODE and OPER label fields are listed for ON tracks

NMT SUMMARY Report:

Histogram Report:

Profile Report:

- SAVE/PRINT: The SAVE/PRINT SCREEN (Figure 23) contains a list of possible output file types, the specific filenames, and the save status: YES or NO. The upper portion contains the file save information.

  The right column consists of YES/NO toggle buttons. Each file type may be controlled individually. If no output data is available -- for example, no nominal tracks have been created – the YES/NO button has no effect.

  The Printer output files may also be independently controlled. If any of the printer output files with default exterior PLT are identified as YES, the PRINT/SCALE options screen is opened. From within this menu the user may select a printer type as well as a scale or drawing size. As before, the use of the ESC key to cancel track drawing to the screen will also have the same effect as the output print file.

  The five printer output files and the accessibility limitations are as below:

  Track View: Assemble from both track and profile modes. The scale and printer menues are automatically opened. This creates a print file with the default extension PLT or a PCX file if the extension PCX has been specified. Track view and profile plots are clean plots, containing background drawing, tracks, and profiles. And only one drawing per page. Screen dumps are restricted by the screen resolution and contain, for profile modes, four plots per page.

Altitude Profile: This option is available only within Profile modes.

Velocity Profile: This option is available only within Profile modes.

Power Profile: This option is available only within Profile modes.

Screen Dump: This option is available from both Track and Profile modes.

DXF Output: This feature creates a DXF file of the data drawn in the currently selected screen mode. This file will contain the background map, tracks, gates, and nominal track. In PROFILE MODE this will contain the data as drawn in the currently selected PROFILE MODE: Altitude, Velocity, or Power setting.

- EXIT: This terminates program execution. The GT8, XRF, and CFG files are automatically updated. If nominal track or flight profile data has been created, the user has the opportunity to save it.

8 Screen Control Utilities

Table 5 itemized the screen control menu options available when in Track mode. All the items on this menu control fundamental display parameters, the basic lower left and upper right coordinates, and the actual screen display itself.

- ZOOMIN: Draw a rubber-banded zoom box around the desired area by clicking the mouse on one corner and then dragging the rubber-banded box to the opposite corner and fixing it with a second mouse click. The proper aspect ratio to preserve a 1:1, x:y ratio on the track window is maintained. This feature is only available in Track Mode.
- ZOOMOUT: This doubles the window size. The current screen center is maintained and the X range and Y range of data displayed on the RADAR TRACK SCREEN are doubled. This feature is only available in Track Mode.
- PAN IMAGE: This menu requires a mouse click at the new screen center location. The lower line of the NDADS MAIN MENU displays mouse and real-world units information. This feature is only available in Track Mode.
- RECALCULATE: This routine scans the RAT file data and restores the zoom and pan coordinates so the display area is centered on the actual radar data coordinates, and horizontal extent displays the full radar tracking area. This feature is only available in Track Mode.
- POINTER: This activates the mouse pointer. As the pointer is moved around on the current screen, the units are displayed on the lower line of the NDADS MAIN MENU. This feature is particularly useful for determining alignment of alternative format PCX background files. To cancel pointer option, press the ESC key. This feature is available in all modes and is dependent on the current mode selection.
- ZOOM VALUES: A table is opened within which the user specifies the min and max ordinate and abscissa limits. For track mode this corresponds to minimum and

maximum x-values as well as minimum y-value. The calculate button is then used to determine the remaining maximum Y-value. This ensures a 1:1 X:Y ratio on the display screens, avoiding track distortion. When operating in Profile mode, the Zoom value option controls the axis limits of the current mode selection: altitude, velocity, or power. The horizontal and vertical limits are independent of one another and may be saved as such. However, leaving the horizontal axis, are length along the track, affects all three graphs independent of the current mode selection.

- RE-BACKGROUND: This option redraws the background feature file over the top of the radar flight tracks. This feature might be needed when using background features for guiding track or gate placement.
- SINGLE DRAW: This feature redraws the ON tracks one at a time, and requires a user prompt after each track. To cancel out of this drawing mode use the ESCape key.
- REDRAW: This option clears and refreshes the screen, drawing only current information.

9 Subset Selection Utilities

The SUBSET SELECTION MENU (SBST) (only available from RADAR TRACK MODE) allows rapid filtering of radar data by adjusting the Track Status to one of three display/processing modes. Subset selection may only occur when in Track Mode. Tracks not meeting ALL of the user-specified criteria are not displayed. There are two track display/processing modes used within NDADS:

ON: Track displayed in red, will be considered when calculating track penetrations, statistics, and creating output summary listings.

OFF: Tracks not displayed on the screen are not considered in any analyses.

When multiple selection criteria have been specified by the user, ALL must be met for the track to have SUBSET-ON status. For example, if only Day operations of F-16s are specified, only those tracks whose start time fulfill both the time AND aircraft type criteria will be flagged as ON. All others will be OFF. Both the subset selections and cross-references between tracks and gate penetrations are written to the specified XRF file upon program termination and file saves.

- Select By Aircraft Type: The aircraft Type subset selection form displays a list of aircraft types (maximum number = 36) as found in the input RAT radar file. The user may toggle each of these aircraft types ON or OFF. Subset calculations will perform a string match on the aircraft type field in the RAT file. The string-matching algorithm used within NDADS is case-sensitive. All the radar data will be scanned and the ON/OFF/SUBSET-OFF status updated according to the user-selection criteria.
- Subset Select by Operation Start Time: Consistency with the noise prediction codes capabilities dictates a breakdown into three time groups as shown in Table 2. The times contained in the RAT file are in seconds after midnight, local time. The

first point in the radar track is used for selection purposes. Time-selection criteria will be used in addition to any other selection criteria in determining the Track SUBSET ON or OFF status.

- Select by Operation Type: Upon selection of the operation type, the OPERATION TYPE SELECTION screen is opened. Within the RAT file, five operation type codes, two standard case-sensitive Operation Type codes and two user-defined types are used. The two user-definable operation type codes may be entered into the appropriate fields in the form for special radar data screening purposes. Operation type selection criteria will be used in addition to any other selection criteria in determining the track ON or OFF status. If Operation types are not to be used in Subset selection, turn all operation types ON by depressing the ALL ON button.

- Select by Runway: The SELECT BY RUNWAY SCREEN displays a list of the available runways within NDADS and their selection status. The case-sensitive runway labels contained within this form are obtained from the Area Input filename, and should match the runway labels in the RAT file. If runways are not to be considered in the selection criteria, turn all the runways ON by depressing the ALL ON button. Runway selection criteria must be satisfied as well as any other specified selections in order for a track to be selected ON.

- Select by On Gate Penetration: Data may also be filtered according to gate penetrations. The Subset select by Gate Penetration screens allows the user to specify which gates are to be considered by turning then ON. Prior cross-references need not be calculated. All tracks are initially turned ON, then cross-references to ON gates for particular track penetrations are determined. When used in conjunction with other Subset selection parameters, all criteria must be satisfied in order for the track to remain SUBSET selected ON.

- Calculate Using Current Selections: All the current selection criteria will be used to determine each track's ON or OFF status. The screen will be cleared and redrawn reflecting the calculation results.

- Turn All Data On: This feature overwrites any prior subset selections and explicitly turns each and every track to ON status.

10 Mode Utilities

This menu is only available from PROFILE MODE. It opens up the OPERATION MODE SELECTOR SCREEN (Fig 23) which contains three toggle buttons: Altitude, Velocity and Power. This toggles between the three inset graphs and activates the selected chart. Only one may be turned on at any given time. This changes the active profile window, as evidenced by the white border. When creating DXF files, only data within the currently selected screen is output to the DXF file.

11 Gate and Vertical Gate Utilities

Gates are windows in space that are used to bundle flight tracks together. Gates may be used for systematic grouping and filtering of radar tracks and profiles, and for aid in developing nominal flight tracks and profiles. Gates are interactively drawn using the mouse on either the RADAR TRACK or PROFILE SCREEN with altitude limits specified via the GATE DATA UPDATE table (Figure 9) form. Track penetrations are calculated and the tracks and gate cross-references are updated and the screen redrawn to reflect the track penetrations. Tracks passing through the ON gates are drawn in red, with the remainder in pale grey. Gates are independently controlled and may be turned ON or OFF. ON gates are displayed in white, and OFF gates in grey. A detailed description of the Gate Utilities options follows.

- Draw New Gate

  From Radar Track View Mode: Move the mouse to one endpoint location of the gate. As the mouse moves, location information is displayed in the status box in the MAIN MENU. The X- and Y-values displayed are in the RAT file radar coordinate system. The length of the gate, in the same units, is also shown and interactively updated. A mouse click fixes the first endpoint of the gate. Move the mouse to the other gate endpoint. A gate line will be interactively updated as the mouse moves. Another mouse click fixes the second (X,Y) location of the gate. The GATE DATA UPDATE TABLE (Figure 9) will now be displayed. A minimum and maximum altitude, in feet MSL, must be entered. A gate label can also be defined. The ON/OFF gate status is indicated via the button. The default when creating a new gate is ON; however, it may be toggled OFF by depressing the status button. During gate drawing, pressing the right mouse button will open the GATE DATA UPDATE TABLE, where location values may be typed in directly.

From Profile View Mode: Move the mouse to the desired arc-length location and click the left mouse button. The mouse may now be moved in a vertical plane (vertical gates are restricted to constant arc-length) to the second altitude limit. As the mouse moves, the gate is interactively updated on the screen, as is the status box displaying the arc-length location, altitude limits, and vertical gate span. During the interactive drawing process, the right mouse button may be used to enter the GATE UPDATE TABLE to directly type in the desired gate endpoint locations. Given the vertical gate arc-length calculation, it is impossible to link together both gates and vertical gates. Hence two sets of gates must be created and maintained within NDADS.

- Type In New Gate: If gate endpoint coordinates are known directly, the drawing of gates may be bypassed and the GATE DATA UPDATE TABLE or VERTICAL GATE UPDATE TABLE is opened directly via this menu option.
- Toggle On/Off All Gates: This menu changes the ON/OFF status of all gates to either ON or OFF. The screen is automatically updated to reflect the new gate status. This feature is not available in vertical gate mode.
- Gate List Update: The GATE LIST UPDATE SCREEN (Figure 9) contains all the initial information about the gates or vertical gates as specified by the current operational mode.

The currently selected gate indice and label is displayed in the Select A Gate button. Different gates may be selected by clicking the button and selecting from the pull-down menu. After selection, the form is updated with the new values. It is the user's responsibility to re-calculate gate penetrations after updating critical fields. X, Y, and Z locations of the gate corners in the RAT file coordinate system are shown. These fields may be edited. The lower left entry field above the Delete key contains the editable Gate Label (four characters). Adjacent to the Gate Label is the Gate Status which may be toggled ON and OFF by clicking on the UPDATE button. UPDATE reads the typed values in the form into memory. The pull-down Select A Gate button/menu are also updated to reflect gate deletions or gate label changes.

The CALCULATE key recalculates track and gate penetrations xxxx the current gate values. For example, several flight tracks are at a slightly higher altitude than the upper gate limit and hence missed during the cross-reference calculations. The upper altitude limit is increased via the GATE DATA UPDATE TABLE. New track

penetrations will be determined and the screen redrawn. CANCEL returns to the MAIN MENU. All user entries since either entering the GATE DATA UPDATE TABLE or pressing the CALCULATE key (whichever occurred last) will be disregarded. OK updates the gate data in memory. Any modifications to the gate locations may invalidate current track and gate penetration cross-references, and will not be automatically calculated. It is advisable under most circumstances to use TRAK/CALCULATE track penetrations to properly update the cross-references. To delete a gate, select the gate of choice and press the Delete key. A confirmation prompt is requested before the gate will actually be deleted.

- Calculate Gate Penetrations: This option causes NDADS to scan all radar tracks and consider ON tracks and determine the track penetrations through the gates. As the caclulation proceeds one can see the ON tracks, which penetrate the gates being drawn to the screen. To prematurely cancel the track penetration analysis, press the ESCape key.

- VIEW GATE PENETRATIONS: As a visual and mathematical aid to developing gates and nominal flight tracks, the capability to view the gates and flight track penetrations from the front rather than in just a top view has been developed within NDADS. This feature is not available from profile mode with vertical gates. In order to view penetrations, they must have been calculated using TRAK/Calculate Track penetrations. In addition, it is the user's responsibility to maintain the cross-reference list by explicitly calculating track penetrations when changes, additions, or deletions to the gate data have been made. When VIEW GATE PENETRATIONS has been chosen, the GATE DATA UPDATE TABLE (Figure 9) appears. As the user selects gates, the penetration screen will automatically appear (Figure 12). The gate area through which tracks are partially cross-referenced is shown in solid white. A true 1 : 1 arc length distance : altitude ratio is maintained. The lower and upper altitude limits are displayed within the window. Tracks as viewed on end are shown as red symbols. A cross-hair is also drawn as the penetration chart. The origin of the cross-hair corresponds to the mean track location. The radius of the cross-hairs in the length and height directions reflects one standard deviation of the track penetration in those directions, respectively.

- The user may toggle between the GATE LIST UPDATE TABLE and the track penetration plot by clicking the mouse. As different gates are selected, the penetration plot is updated accordingly. Modifications to the gate locations may be made from the GATE LIST UPDATE TABLE. In order to reflect these changes in the track penetration plot, the calculate button must be used. NOTE: Only ON tracks within the selected ON set of tracks and ON gates will be analyzed when calculating track penetrations.

12 Track and Profile Utilities

The track utilities menu contains operations associated with track drawing, displaying, and calculating. Within NDADS each series of radar transponder points associated with a particular beacon code is considered one track. These tracks, contained in the RAT file, are superimposed on the background map. Nominal tracks, created by the user, are used by the noise analyses codes and are explained in Chapter 13.

The following explains the features in the Track and Profile Menu as applicable (see Tables 5 and 6).

- Toggle All Tracks or Profiles ON/OFF: All tracks are initially turned to ON. Selection a second time turns them all OFF. The status of the first flight track in the RAT file is used to determine ALL ON/OFF status. The RADAR TRACK window is updated to reflect the changes. ESC to cancel screen redraw impacts only the display, not the actual ON/OFF status.
- Invert Track or Profile ON/OFF Status: This feature changes all ON tracks to OFF and OFF tracks to ON. The RADAR TRACK AREA will be updated to reflect the ON/OFF status changes.
- Calculate Track or Profile Penetrations: All ON tracks and ON gates are analyzed in this process. Tracks that penetrate gates will remain ON; the rest will be turned OFF. The screen is updated to reflect the penetration calculations.
- Turn ON Tracks Through ON Gates: This feature is meaningful only if track penetrations have been calculated and track and gate cross-references established. After selection, the GATE DATA UPDATE TABLE is opened for the purposes of identifying the desired gates. Upon entry, all gates are turned OFF. The user may select any number of gates to display cross-referenced tracks simply by turning them ON. After the OK button has been pressed, the screen will update

with the new track status. Tracks with positive cross-references, (i.e., tracks that penetrate the ON gates) will be drawn.

When grouping large amounts of RAT data into manageable bundles for creating nominal tracks, gates should be drawn in a methodical and systematic fashion. After all penetrations have been calculated, any remaining unreferenced tracks may be easily viewed by selecting turn ON tracks through ON gates with all gates ON. The invert track ON/OFF status may then be used to clearly identify those unreferenced tracks. Summary operation information may also be easily be generated for quantifying these unreferenced tracks. This feature is not available in Profile mode, as all vertical gates are always ON.

- Edit a Particular Track or Profile: (UNDER CONSTRUCTION)
- Individual Track or Profile Information: On occasion the user may find it necessary to identify and edit individual track qualifiers. This feature opens up a data form which may be viewed and edited. Simply point at the desired track and click the mouse button. When using this option in Profile Mode, only the altitude distribution may be chosen for "point & click" information. The processing time is highly dependent on the number of ON tracks. Internally each is scanned and a proximity factor calculated. As all tracking data is stored and read from the direct access RAT file (rather than imposing a memory-limit-induced maximum number of tracks). This may take several seconds or even a minute, depending on the amount of RAT data. Once the selected track has been identified, the track or profile is drawn in black and the TRACK INFORMATION TABLE (Figure 25) is opened. All available flight track information is displayed:

  - Track ON/OFF Status
  - Call Sign
  - Aircraft Type
  - Runway
  - Operation Type
  - RAT User Field
  - Beacon Code
  - Date
  - # Aircraft in the Sortie
  - Reserved Code

These changes may be saved to disk in the form of a new complete RAT file, with the filename as specified in the TRACK INFORMATION TABLE. After saving the data, the user has the option of switching to the new updated RAT file for continued NDADS execution. If the TRACK INFORMATION TABLE was opened just for viewing purposes rather than for changing data, the CANCEL button should be used to return to the NDADS MAIN MENU.

- INCIDENT ANALYSIS: This form (Figure 26) allows the user to specify discriminating information about a particular incident. NDADS will then search all ON tracks in the RAT file for parameters meeting the specified user search criteria. This is still under development.

13 Nominal Track and Flight Profile Utilities

One of the primary intentions of NDADS is the rapid and statistically accurate creation of flight tracks and profiles based on actual RADAR data. The previous four chapters describing the Screen, Subset, Gate, and Track utilities are aimed at creating meaningful subsets of radar track data from which Nominal Tracks are to be drawn. This chapter describes the actual Nominal Track and Flight Profile creation process.

Arc-length distances as displayed in radar track mode are in feet relative to the threshold point. When operating NDADS in BPS mode, the departure threshold, or S = 0.0 point, is at the beginning of the active runway; the arrival threshold, also S = 0, is the endpoint of the active runway. Arrivals are drawn in reverse. Displaced thresholds are not currently implemented in NDADS. Instead, use an additional runway whose endpoints correspond to the displaced threshold points. When operating NDADS modes other than NMAP, the departure threshold, or S = 0 point, is the beginning of the active runway; the arrival threshold is at S < 0 and may be placed by the user. The second point must be at S = 0.

Nominal tracks are required to start with a straight segment aligned with the chosen runway. In BPS mode this requirement is reversed for arrivals. Subsequent segments may be either curved or straight. Curved segments are required to be circular in shape and tangent to the end of the previous segment. A detailed description for the Nominal Track and Flight Profile Utilities follows.

- Radar Track View

  Straight Segment: Draw a straight segment. If this is the first segment in the Nominal Track, the RUNWAY SELECTION TABLE (Figure 7) is opened. All runways are initially turned OFF. The user identifies the ONE runway for this track by toggling its status to ON. Runways may be selected by clicking on the Runway Selection button

and choosing one from the list of available runways. Other information about the runways including coordinates and name is displayed in this form. After one runway has been turned ON, press the OK button.

After the runway has been identified, the track type must be selected. The OPERATION SELECTION FORM is displayed. Toggle between Arrival, Departure, and Closed Pattern types. The buttons are automatically linked so only one operation type may be selected at a time. When finished, press the OK button.

If multiple runways or no runways have been selected, an error message appears. The cancel button terminates the straight Nominal Track creation and returns to the NDADS MAIN MENU.

During the track drawing process, the status box indicates both the noise position heading and track length using the RAT file radar coordinate system. At any time the right mouse button may be clicked to open up the STRAIGHT SEGMENT INPUT FORM. The user may alternatively type in the segment length and press OK. Cancel returns to the NDADS MAIN MENU without creating the segment.

Curved Segment: After at least one straight nominal track segment has been created, the user may elect to draw a curved segment. The cross-hair points to the end of the curved segment. As the mouse is moved, the screen is updated interactively with a circular segment, which is tangent to the previous segment and ends at the mouse location. Curved segments may follow either straight or curved segments. As the mouse is moved, the STATUS BOX displays information about the curved segment including the radius of the segment in the RAT file units and the initial heading angle of the segment, the ending heading angle of the segment in degrees, and the overall change in heading for the segment.

Also displayed and interactively updated on the screen is a straight segment, tangent to the end of the curved segment. This may be used to guide the curved segment endpoint location location while considering a potential succeeding straight segment.

As in the STRAIGHT SEGMENT creation, the right mouse button may be clicked to alternatively type in the curved segment definition. The CURVED SEGMENT INPUT FORM displays and allows the user to update the segment radius and change in

heading in degrees. Sign convention dictates that a positive heading change is a right turn.

Delete Segment: This option deletes the last segment created, effectively backing up by one segment. If the first segment is deleted, the chosen runway selection and operation type are also deleted and must again be defined if creating another nominal track.

New Track: If a previous track was read in, created, or otherwise loaded into memory, the user will be given the option to save and append the nominal track to the current nominal track file. Choosing NO clears the track out of memory without saving it to disk. Choosing YES opens up the NOMINAL TRACK DEFINITION FORM (Figure 21) where the nominal track filename may be changed, and when the track ID and track comments may be input. After track saving or denial, the user is prompted to select a runway and operation type as in the initial straight segment selection.

- Profile Mode

When in profile mode (Figure 18), the three graphs on the right side, Altitude, Velocity, and Power Profiles display background radar data, vertical gates, and mean and standard deviation of the track and gate penetration locations. This information may be used to guide in the profile creation process.

Add New Segment: The first time this is selected, the user is prompted via the OPERATION MODE SCREEN (Figure 15) to specify arrival or departure or Closed Pattern. For departures in NMAP, the starting point is restructured to arc-length, S = 0 the threshold location. For arrivals in NMAP mode the same is true. Clicking on the right mouse button opens up the NOMINAL PROFILE INPUT FORM where the user may directly type in the values.

Once the first altitude point has been chosen, the velocity becomes the active chart, as evidenced by the white border. The user may now click the left button on the velocity or, via a right mouse click type the velocity value into the NOMINAL PROFILE INPUT FORM. The Power Profile Chart now becomes active and the power setting must be clicked on or typed in.

After the initial points have been specified, the endpoint of the segment must be entered in a similar fashion. The segment display is interactively updated as the user moves the mouse on the display. Using the interactive drawing process, a vertical bar on all the displays marks the arc-length location of the mouse in order to determine the appropriate arc-length breakpoints considering not only altitude and velocity radar data but also if available power data too.

Delete A Segment: This feature deletes the last drawn profile segment. Additional segments may be appended.

Profile Table: This opens up the PROFILE TABLE SCREEN where all the current profile information is displayed. The user may edit values directly from within this table.

14 Annotation and Definition Utilities

Maintenance tables for display and data calculation are grouped together under the ANT8 button. Any changes to data from within this menu will not be saved to disk, and will remain in effect only during program execution. For example, any changes to the runway endpoint locations will not be written to the Area Input File. Subsequent NDADS executions will not have the privilege of knowing the user-specified runway endpoint modifications. It is therefore recommended that when dealing with cases where reproducibility is of concern, that the Area Input Files be edited outside NDADS to reflect the desired changes in the data.

- RUNWAYS: The runways, as read in from the Area Input File during program initialization, are displayed in the RUNWAY SELECTION TABLE (Figure 7). The runways may be selected by clicking on the Select A Runway button and highlighting the desired runway. The fields displaying the X and Y locations of the runway endpoints will be automatically updated. The runway label field is left of the runway ON/OFF status button. If the label is modified, clicking on the UPDATE button will update the Select A Runway pull-down selection menu. The ON/OFF toggle button controls the runway status. When drawing the first nominal track segment, only one runway may be turned ON. Only one runway will be drawn by NDADS (Runways contained in the NDD or other format background files are not affected). If additional runways need to be displayed along with the nominal track, enter the RUNWAY SELECTION TABLE after the track has been drawn. Cancel returns to the MAIN MENU without any user entries after the last UPDATE takes effect. OK reads the user changes from the appropriate table fields and implements them in the current execution of NDADS. Care must be taken when updating runway endpoints. Prior tracks may have been created and displayed with

the old coordinates and may no longer align with current coordinates. Screen/ Redraw may be used to refresh the screen and display current settings.

- SPECIFIC POINTS: Specific Point data, labeling, ON/OFF status, and RADAR TRACK SCREEN display are controlled via the SPECIFIC POINT TABLE (Figure 27). As with the runways, this data is initially obtained from the Area Input File but may be modified by the user. Any changes made to the specific points affect only the current execution of NDADS and are not saved to disk.

  Specific Points are selected from the pull-down selection menu activated by clicking on the Selection button. X and Y locations, specific point label, and status is automatically updated. Specific points may be deleted. The update key is used to reflect any changes in the Specific Point label in the pull-down menu. Cancel returns to the NDADS MAIN MENU without saving any changes since the last time the UPDATE button was pushed. OK saves all user changes to the specific point and returns to the NDADS MAIN MENU.

- Navigational Aids: Navigational Aids data, labeling, ON/OFF status, and RADAR TRACK SCREEN display are controlled via the NAVIGATIONAL AID TABLE (Figure 28). As with the runways, this data is initially obtained from the Area Input File but may be modified by the user. Any changes made to the Navigational Aids affect only the current execution of NDADS and are not saved to disk.

  Navigational Aids are selected from the pull-down selection menu activated by clicking on the Selection button. X and Y locations, specific point label, and status is automatically updated. Navigational Aids may be deleted. The update key is used to reflect any changes in the Navigational Aids label in the pull-down menu. Cancel returns to the NDADS MAIN MENU without saving any changes since the last time the UPDATE button was pushed. OK saves all user changes to the specific point and returns to the NDADS MAIN MENU.

- Background Map: This option controls the intensity of the background map display. The user may select between a Pale, Medium and Dark display (Fig 29). The screen is automatically refreshed upon exiting the Background Intensity Menu Form.

- Track Labels: Individual tracks may be labeled with a myriad of descriptors as defined in the RAT file. The TRACK LABEL TABLE allows the user to control the labeling options.

15 Error Messages

During program execution, error messages may appear indicating problems with data or improper user selections. These messages are informational in nature and begin (for diagnostic purposes) with the Fortran subroutine name generating the message followed by an explanation. Additional information about the individual subroutine's purpose is given in Appendix A, the Programmer's Reference Guide to NDADS Fortran Subroutines.

"BPSPTS: Error Opening Area Impact File": The specified file could not be opened.

"DRAWNAVA: Cannot Find Symbol File: Computer.smb.": NDADS was unable to locate the specified file in either the current directory, the NDADS executable directory, or in a path directory.

"GETRUN: One Runway Must Be Selected": All runways are turned OFF. When drawing the first segment in a normal track, one runway must be selected ON. From the RUNWAY SELECTION TABLE, toggle the desired runway ON. Only one runway is permitted to be ON. More than one runway is turned ON. When drawing the first segment in a normal track one, and only one, runway must be selected ON.

"INMPTS: Runways Not Found in Area Input File": An error occurred while reading the input area file. Check for valid INM format and the RUNWAYS keyword in the file.

"NMTKFORM: Error Reading NMT File": An error was encountered when reading data from the specified nominal Track file.

"OPENITUP: Action Not Permitted in BPS Mode": This feature is not available when running in BPS mode. Only flight power profile files (FPW) may be read in from BPS modes.

"OPENITUP: Action Not Permitted in INM Mode": This feature is not available when running in INM mode. Only flight profile files (FPR) may be read in from INM modes.

"OPENITUP: Action Not Permitted in Track Mode": The requested Profile file type may not be opened unless in Profile mode.

"OPENITUP: Impermissible File": User-selected operation requires shut-down and re-initialization of NDADS. This error message is displayed when the user attempts to open a new Area Input File or Configuration File. These may only be changed during initial startup of NDADS in the PROJECT SCREEN. Answering the query "EXIT NDADS and restart?" with a NO (default) will continue program execution uninterrupted, but without any active filenames being modified. Answering the query with a YES will terminate program execution, giving the user the opportunity to first save current work.

"OPENITUP: Unidentified File Type": The extension type on the selected file is not recognized. Select a different file.

"PICKONE: No Tracks Were Selected": Your mouse click location was farther away from any tracks than the allowable tolerance limit of 5 percent screen width in world units.

"PROJSCRN: Area Input File Not Found": The specified Area input file does not exist in the current directory.

"PROJSCRN: RAT File Not Found – Proceed Without Radar Data?": The specified file does not exist in the current directory.

"RATUPDT: Error Initializing New RAT File": The RAT file could not be opened.

"READFLPR: Error Opening FPR File": An error was encountered when opening the specified Flight profile (FPW) file in INM mode.

"READFLPR: Error Opening FPW File": An error was encounteered when opening the specified flight power profile (FPW) file in BPS mode.

"READNMTK: Error Opening NMT File": An error was encountered when opening the specified Nominal Track file.

"READNMTK: Error Reading NMT File": An error was encountered when reading the nominal track file. Verify that the format of the file is the expected format.

"READFLPR: Error Reading FPR File": A format error was encountered when reading the specified flight profile (FPR) file. Confirm that the file format is in the expected INM mode.

"READFLPR: Error Reading FPW File": A format error was encountered when reading the specified flight power profile (FPW) file. Confirm the file format is the expected BPS mode.

"RWYFORM: Delete Button Under Construction": This feature is not avail-able in NDADS V2.0.

"SUBSET: Operation Not Available": Subset selection is not currently set to track mode, the required mode for subset selections.

"TRKLOOP: Radar Data Not Available": No RAT data file is currently allocated for selection. Enter a valid RAT filename in the Project form.

"XRFINIT: Misaligned XRF File": This error usually occurs when either the RAT or GT8 file have been changed and the number of tracks changes, hence the track and gate cross-references are mis-aligned. To remedy the situation, delete the prior XRF file by selecting YES. Track penetrations can be recalculated using TRACK/TRACK-N-GATE with ON/OFF selections as desired.

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Appendix A

Programmer's Reference Guide to

NDADS FORTRAN Subroutines

The FORTRAN program details included in this section are intended for documentation purposes. They may, however, be used in the event of any "Error Traceback Messages" to guide the user and programmer. Appendix B documents the program subroutine hierarchy (only major subroutines are included); each subroutine's functionality is described in the following pages.

ACSLCT: This subroutine allows the user to select which aircraft types are to be worked on in the NDADS editing session. The aircraft displayed is based on the aircraft types in the RAT file. After the user has switched ON/OFF to indicate the aircraft types, the XRF file is updated with a 3 for SUBSET OFF, and 1 for SUBSET ON. Only the logical true combination of times and aircraft types are set to XRF file 1, or ON status – i.e., all subset selection criteria must be met for the track to turn ON. The Selected ON tracks which are later turned OFF will appear grey, while the selected ON tracks will remain red. The total number of aircraft types are contained in the common block include file TRKDATA.INC.

ALLGT8: This subroutine loops through the GATEDATA GATESTAT array and turns all gates to imode (0=OFF, 1=ON).

ALLTRK: This subroutine loops through the TRAKSTAT XRF array and turns all flight tracks to imode (0=OFF, 1=ON).

BOX: This subroutine receives the four corners of a box in window real-life coordinates and draws a box in the graphics area using the currently set color.

BSPTS: The purpose of this subroutine is to read a BASEOPS BPS file and extract the Cartesian coordinates of the runways, navigational aids, and specific points. These coordinates are then translated to the system of the radar antenna. The coordinates of the radar antenna are passed to this subroutine by the host program through the variables antx and anty.

For runways, the following assumptions are made:

1. Thresholds are only specified to the nearest foot.

2. Glide slopes are only specified to the nearest tenth of a degree.

Any deviation from these assumptions will result in errant data passed to the host program. Also, lat/long coordinates are ignored.

CENTERIT: This subroutine restores the zoom and pan characteristics to be centered at (0,0), the Radar origin with ±100,000 feet shown in the X direction, and the extent of y direction as determined by the screen aspect ratio.

CHECKONE: This subroutine checks that the user has only one gate turned ON. If one gate only, this routine returns the index in IONE; if not, this routine returns 0 in IONE. If successful, the XRF array is updated such that only the selected Gate and the associated penetrating tracks are set to XRF=1; the rest are set to 0, unless they are already set to 3, in which case they stay that way. If no gates have yet been defined, this routine returns -1 in IONE.

CURVED: This routine allows the user to draw curved flight track segments. The basis is Graphics routine iGrArc, which draws elliptical arcs. In this routine we are forcing it to only draw circles. The circle is tangent to the prior straight segment end; this determines the line on which the circle center lies. The mouse will then be pointing to the other end of the circular arc. This will determine both the radius and arc segment of the circle. As the user moves the mouse about, the circular segments are drawn and interactively updated on the screen. A straight line segment is appended to the end of the curved segment under construction for visual guidance as to heading angles. A mouse click at the final location will fix the circular arc and refresh the screen.

CURVFORM: This routine allows the user to type in the curved values instead of interactively drawing them in with the mouse.

DELUPDT: This subroutine receives as input the gate index of the gate to be deleted. It reindexes all the remaining gates, and also updates the cross-reference XRF file (TRKSTAT variable). If the index gate is found in TRKSTAT, the user is prompted the first time it is found to ensure his/her deletion desires. This routine operates in the following modes:

- IMODE=0: Update Gate data.
- IMODE=2: Re-index v-gate data after deleting a main gate.
- IMODE=3: Update v-gate data.

DRAWARCL: This routine draws the profile arts data to the screen. ON and OFF tracks are drawn. TRKSTAT = 3 are skipped. The screens are switched in here – the values for screen limits are stored in trpldat.inc. min and max limits must have already been set before coming into here.

DRAWDATA: This routine draws the Radar data one flight track at a time in the previously defined Radar Window. It checks the LABLSTAT valuable in common block INITZ for labeling tracks with Aircraft Type, Operation, Call Sign, Start Time, all times at nodes or other user-selected labels. Labels are directly from the RAT input file.

- IMODE=0: This routine checks the XRF track status for ON/OFF/ SUBSET OFF, and draws with the appropriate color, or skips the sortie altogether (TRKSTAT(n,1)=3).
- IMODE=1: This routine skips the sortie altogether when (TRKSTAT(n,1)=0 or 3. Used for Nom track section.
- IMODE=2: Same as IMODE=0, but also calls DXF routines.
- IMODE=3: Same as IMODE=1, but also calls DXF routines.

DRAWGT8S: This subroutine loops through all the GATESTAT in the GATEDATA common block and draws the ON or selected (GATESTAT=1) on the screen. It is assumed that all OFF or (GATESTAT=0) gates have already been cleared from the screen. For GATESTAT=3 the Gates are not drawn at all. This subroutine operates in the following IMODES:

- IMODE=0: Draw Gates to the screen Based on GATEDATA.inc
- STAT=0 Off in Green
- STAT=1 On in Red
- STAT=3 Ignore, draw nothing
- IMODE=2: Draw Gates to the screen, not drawing STAT=0 OFF at all, and drawing STAT=1 ON in Green.
- IMODE=3: Draw Vertical Gates based on VGATE.inc. No STAT, all drawn in Green.
- IMODE=4: Same as IMODE=0, but also outputs gate to the DXF file.
- IMODE=6: Same as IMODE=2, but also outputs gate to the DXF file.

DRAWGTP8: This subroutine draws the particular Gate, (ig), and the penetration points for all XRF'd files to the screen. The mean and standard deviations are also drawn onto the screen in Light Red in the form of error crosses. The error crosses width and height are 1 standard deviation in x and y, respectively, and the error cross center lies on the mean.

DRAWNAVA: This routine draws the input BPS file navigational aids into the radar screen area.

DRAWNOMP: This program controls the drawing of the Nominal Profile points. The variable iSwitchMode is checked to see if the active window and variables are Altitude, Velocity, or Power. It then interactively adjusts all the windows while waiting for the user to click the mouse. Once the mouse is clicked, the point is input into memory.

DRAWARCL: This routine draws the profile arts data to the screen. ON and OFF tracks are drawn. TRKSTAT = 3 are skipped. The screens are switched in here – the values for screen limits are stored in trpldat.inc. min and max limits must have already been set before coming into here.

DRAWONE: This routine draws one flight track in the previously defined Radar Window. Three operational modes exist:

- IMODE=1: Read in the next sortie from the ARTSDATA file and draw the one track of data contained in common TRKDATA. The track to be drawn is the one to which the ARTS file pointer is pointing. It is the responsibility of the calling subroutine to make sure the file pointers are in the correct place and that the NTRK variable in the trkdata common is set correctly.
- IMODE=2: Draw the one track of data contained in common TKEDITR. It draws the track in red with cyan blips at the track nodal definition points. Drawing in (X,Y) mode.

- IMODE=3: Re-draws the selected point marker in Bright White based on an (X,Y) view of the temporary Flight Track.
- IMODE=4: Re-draws the selected point marker in Bright White based on an (S,Z) view of the temporary Flight Track.

DRAWPROF: This subroutine draws the altitude versus arclength RAT file flight profiles. The Graphics area should already be set up. TRKSTAT = 3 are skipped.

DRAWRNWY: This routine draws ON input area file runways into the Radar window graphics area. The runway label is to the right and down of the first runway-defining endpoint. The following operatioal IMODES exist:

- IMODE=0: Draw Runway Data to the screen.
- IMODE=1: Draw Runway Data both to the screen and the DXF file.

DRAWSPPT: This routine draws ON input BPS file specific points as Blue Pyramids into the Radar window graphics area. The label is down and to the right of the symbol.

DRAWSTRT: This subroutine allows the user to draw the first straight segment on the screen using the mouse. The direction is restricted by the runway orientation. This angle, Head0, is set by GetRun before this routine. Errors or cancelling by user returns err=99. XBP and YBP in the bpstrk.inc common block are updated before leaving. Variables x1,y1 are the end of the prior segment and do not change. Variables xL and yL are the current being drawn segment endpoint and are relative to the x1,y1. Theta is constant for the straight line segments and are pre-set before this routine. Upon entry to this routine, Isegon-1 points to the end point of the prior segment, and isegon to the current being drawn segment endpoint. If the user escapes or quits out, the err code is set, and the isegon is decremented after leaving this routine.

DUMPCNFG: The purpose of this subroutine is to write out the current zoomnpan characteristics to the ASCII CFG file.

DUMPFLPR: This subroutine dumps out the current Flight Profile into the Flight Profile File, *.FPR. The Profile is appended to the end of the file. It is the user's responsibility to maintain the *.FPR file. The common block RUNOPT contains the variable OUTYPE which specifies area file formats.

DUMPGT8S: This subroutine writes out the current GATE information to GT8FILE. If the gatefile does not exist, it prompts the user for the gate filename.

DUMPNMTK: This subroutine writes out a file segment containing the Nominal Flight Track as defined by the user. The output file segment is in BaseOps format. The output file is projname.NMT (the same prefix as the Config, Gate, and XRF file, but contains the suffix NMT, for Nominal Track). All data is appended to the NMT file. If projname.NMT does not exist, it will be created. Maintenance of this file is the user's responsibility.

DUMPXRF: This subroutine dumps the cross-reference list between Gates and Tracks from the variable TRKSTAT in common TRKDATA to the file *.XRF.

DXFARC: This subroutine writes DXF entity output for an arc.

DXFCIRC: This subroutine writes DXF entity output for a circle.

DXFEND: This subroutine writes closing trailer to DXF file.

DXFHEAD: This subroutine writes DXF file header.

DXFLINE: This subroutine writes DXF entity output for a line segment.

DXFPOLY: This subroutine writes DXF entity output for a polyline.

DXFTEXT: This subroutine writes DXF entity output for standard text.

DXFTRACE: This subroutine writes DXF entity output for a trace.

EDTNMPRF: This subroutine loads the Nominal Flight PRofile into the TKEDITR.inc Arrays for moving points via the mouse. It then walks the user through the editing a point process.

FEELIE: This routine initializes various interacter options and specifies the "feel" of the program including window, menu, and mouse parameters.

FILEMGR: This is the pull-down file manager menu.

FLTPRFORM: This subroutine creates the form where the user inputs the Flight Profile information for both INM and PBS operational modes. For INM Modes, much of the information is not needed, and hence not displayed on the form. The standard numbers for aircraft and operation types for bhe BPS stuff are based on NOISEMAP 6.

GATEINIT: This subroutine reads in a prior GATE file containing the gate starting and ending (x,y) locations, the minimum and maximum gate altitude, the label, and the ON/OFF status flag. The data contained in this file are in feet in the RAT file coordinate system. If a prior Gate file does not exist, it initializes the Gate counters in the common blocks. The second portion of the gate file contains gate penetration information. Basically, the variable PGATE(ngates,nXRFs,2) from common block GATEDATA is also read in. If the file does not exist, this array is also initialized to all 0.

GATES: This subroutine turns control over to the gate selection, gate drawing, updating, and manipulation portion of the program. It allows the user to draw gates, select penetration tracks name, and edit and delete gates. In this portion of the program, track selection based on planform or top view is permitted. For the user to refine track selection vertically, the other portion of NDADS which does profile drawing and selection must be used.

GATEUPDT: This subroutine allows the user to go into the gate listing and update gate labels and selection status (ON/OFF). This screen lists the gates and their vitals, and allows the user to scroll up and down the list to update labels, turn gates ON/OFF, etc. Available options within this routine are:

1. Toggle gates ON/OFF;
2. Change gate labels;
3. Change gate minimum and maximum altitudes;
4. Edit the gate (x,y) location;
5. Delete a gate;
6. Calculate gate penetrations.

The user must keep in mind that changing the gate altitudes will not automatically update the XRF files, and that the gate penetration must be recalculated. The delete gate portion of this routine does re-index the XRF file gate indices.

GETCOLOR: This subroutine sets up the various default color numbers and stores them in the COLORS common in RUNUPT.inc. In the future, this routine may have an interactive user color selection.

GETFILE: This subroutine opens up a form which allows the user to enter a DOS filename up to 12 characters. Checking of the filename for availability/validity is the responsibility of the calling subroutine.

GETNMPTS: This subroutine calculates the (x,y) segment endpoints based on the read-in Nominal Track. Prior to calling this routine, the starting point, and starting Heading, HEAD0 has been initialized by a call to GETRUN.

GETRUN: This subroutine defines the starting runway points for the first segment. The user is asked to select the runway index from the runway listings. They appear as in the Annotation sections. Upon entry, all are turned OFF, and the user toggles the appropriate runway ON. Only one runway may be turned ON when leaving this screen. If the user later desires to display other runways, they may explicitly be turned ON by entering the annotation screen. The starting point for the first segment is set equal to the first runway point. Later, when displaced thresholds, etc., are to be added, this routine would be a logical place. The runway heading, in degrees, is also calculated; this heading must be maintained by the starting segment. Head is returned in radians, as the result of an ATAN2 operation.

GRFXSET: This routine initializes the screen to the max hardware available resolution allowable. Interacter Routine calls are used here.

GT8PENET: This subroutine loops through all the tracks which are turned ON and then through all points in a given ON radar flight track (loaded one at a time into common block TRKDATA) and based on given gate endpoints and altitude limits and based on subroutine ONETRACK, determines whether gate penetration is true or false. The TRUE tracks are then highlighted on the screen in LIGHT RED. The false tracks are highlighted on the screen in Brown. Subset selected OFF tracks are ignored.

ILEN: This routine returns the length of a character string minus the trailing blanks.

INMPTS: The purpose of this subroutine is to read the runway data out of an INM V4.x Input deck.

INVSLCT: This subroutine turns all OFF tracks to ON and all ON tracks to OFF. Subset selected OFF tracks are not affected.

LAYOUT: This subroutine sets the basic screen layout.

MAGDFORM: This opens up a form where the user types in the Magnetic Declination angle in Degrees. It is initialized to 0 if not already set to something other than that.

MENU: Generic Menu Routine with 3-D Push Buttons across the top.

MGPENSLCT: This is the form for selecting by Main Gate Penetrations ON or OFF.

NAVAFORM: This subroutine opens up a form which allows the user to control the Navigational Aids ON/OFF Status, the x,y,z values. This routine does not draw anything to the screen.

NAV2SCN: This subroutine outputs one line of Navigational Aid data to the preset screen. The cursor must already be positioned in the appropriate place on the screen for the output using call settextposition. The NAVAID data for NAVAID number I will be output to the screen. If I is input as 0, a blank line will be output.

NDADS: Main program.

NEWGATE: This subroutine allows the user to draw a gate interactively on the screen using the mouse. After the gate is drawn, a form pops up, with pre-set values for altitude limits, and gate names. The user then has the opportunity to update these values and parameters.

NMTKFORM: This subroutine gets the used defined stuff for the Nominal tracks. It is used to select a pre-existing NMTK or to fill in the details for a newly created NMTK. Operational Modes are:

- IMODE = 0: User reading in NMTKs allow selection of track number. No updating of information is allowed in this mode. Returns IMODE = -99 when user cancels out and does not want to read anything in or when there is an error reading in the user-selected track from the NMT file.
- IMODE = 1: User has created NMTK and must enter details.

When in IMODE = 1, the track number cannot be changed. When in IMODE = 0 the track identifiers – labels, comments, etc. – cannot be changed.

NOBLANK: This routine removes all spaces from the input buffer character string.

NOMPDRAW: This routine draws the current nominal profile stuff (0-nPROFon) on each of the triple split screens. If the vertical axes variable is 0, Nothing is drawn.

NOMPFORM: This routine allows the user to type in the Nominal Profile values instead of interactively drawing them in with the mouse. IMODE returns -99 if the user selects the cancel or other escape key sequence.

- IMODE = 1: Get ArcLength and Altitude
- IMODE = 2: Get Velocity
- IMODE = 3: Get Power Setting

NOMPROF: This subroutine serves as the master loop for the Nominal Profile and Velocity Profile generation portion of the code. IRUNMODE = 4 before entering this routine. iSwitchmode must be checked to see wither in Altitude, Velocity, or Power modes.

NOMTKOPS: Writes the Nominal Track Options to the Instruction box on the right portion of the screen.

NOMTRACK: This is the main pull-down menu for the nominal Track operations.

ONETRACK: This subroutine loops through all points in ONE track. The track data is pre-loaded into common block TRKDATA. Based on given gate endpoints and altitude limits this

calculates whether or not the flight penetrates the gate. The variable ANSWER relays this conclusion. Other statistical information is also calculated and returned in common block PENETR8. This data may be used by the nominal flight track algorithms. Input parameters and descriptions:

- X1: Gate Start X location
- Y1: Gate Start Y location
- X2: Gate End X location
- Y2: Gate End Y location
- Z1: Gate minimum Altitude
- Z2: Gate maximum Altitude

Return Variables and descriptions:

- ANSWER: Intersection logical, FALSE for no intersection
  TRUE for intersection

OPENDXF: This subroutine opens up the DXF file with the user-specified name.

OPENITUP: This routine controls the file opening and reading in and ultimately the drawing on the screen. It uses the directory listing and allows the user to select a file, then open it up. This is a form window with filetype and filename buttons in addition to the standard OK and Cancel buttons.

The file type is selected by the user, then a display of all available files with a scrolling menu is displayed. Only file types appropriate for the current IMODE are permitted. Selection of inappropriate types displays an error message in the STATBOX.

If the Impermissible file error is generated, IMODE returns -99 if the user has elected to terminate program execution.

On Entry: IMODE = 1 if Permissible file types are to be monitores.

On Entry: IMODE = -50 if Permissible File types are to be ignored.

This routine returns IMODE = 0 if all is well.

OPFORM: This routine opens up a form in which the user selects between Arrival, Departure, or Closed Pattern. One must be ON and all the others OFF.

OPMODE: This routine opens up a form in which the user selects between Main gate Profile Modes. The form contains two linked buttons. One must be ON and the other OFF.

OPTPSLCT: This subroutine allows the user to select which operation types are sub-selected ON.

PANIT: This routine allows the user to pan the radar window screen left or right, and up or down. It updates the window coordinates in the ZOOMNPAN common block. The user is asked to click the left mouse button at the desired new center of the screen. To pan very large distances, this routine may need to be called up multiple times by the user.

- IMODE = 1: Used for (X,Y) drawing mode with common ZOOMNPAN.

- IMODE = 2: Used for (S,Z) drawing mode with common TKEDITR.

PG8CLEAR: This routine goes into the Gate penetration variable, PGATE, and clears out the data, then recalculates the penetrations. This is used when Subset Selections have been changed.

PICKINFO: This subroutine places the sortie info from the selected track onto a form on the screen. The user may update the information on the form and save it as a new artsfile.

PICKONE: This subroutine receives as input the pixel locations of a mouse click. It loops through the RAT tracks, determines which one is the closest, toggles its ON/OFF status, and redraws only that one track with the new status color. The final selected track is read using READARTS(4) so that the T & V in the commons are updated.

POINTER: This routine allows the user to point around the screen and reports the location to the STATBOX via Mouseit.

POWRLMTS: This subroutine allows the user to enter the ppmin and ppmax values directly into a form for triple mode use.

PROFLOOP: This subroutine is the main loop within the profile drawing options. This options include the following:

- IMODE=1: Drawing the track penetrations through the gates, edge view.
- IMODE=2: Drawing the Altitude versus arclength for the flight tracks.

For the above options, only ON gates and tracks will be drawn.

PROFMOD: This subroutine draws the altitude versus arclength profile for the current track being edited. The (x,y,z) values are stored in the temporary array contained in common TKEDITR. It is similar to subroutine ARLTARC. The drawing puts blips at the actual Radar data points.

This routine operates in the following modes:

- IMODE=1: Initialization of limits and data.
- IMODE=2: Re-draw with new zoom and pan limits pre-set.

PROJSCRN: This subroutine places the project file and working directory information into a pretty form for the user to update. The defaults may come in from the command line as a program execution input, or if left blank the user may just fill in the form. IMODE returns -99 if the user cancels out of this menu.

RATUPDT: This subroutine is invoked when the user wants to update the RAT file with the track defined in the temporary arrays contained in common TKEDITR.inc. The filename pass in, datfile, is the current RAT data file. It will not be overwritten. The new name is outfile. Unit #11 is the new output file number. READRAT routine has the original input RAT file associated with it, Unit #1. Any problems, this returns with IMODE = -99.

- IMODE=0: Output all tracks to the RAT file.
- IMODE=1: Output only the ON tracks to the RAT file.
- Returning IMODE: -99 means to cancel out;
  -50 means to try again.

RDCNFG: The purpose of this subroutine is to read the ASCII configuration text file containing the Cartesian coordinates of the ARTS radar antennae site. This subroutine requires that the coordinates are defined consistently with the BASEOPS input file; that is, they are located in the system where the first end of the first input runway is located at (0 ft, 0 ft) and X is east, Y is north. The coordinates must be in (2 (1x, f9.1)) format and appear on the first line of the configuration file. The second portion of the configuration file defines the magnetic declination at the ARTS radar antennae site. This should appear on the second line of the configuration file with positive degrees indicating true north is west of magnetic north, and negative degrees indicating that true north is east of magnetic north using format (f6.1). Zoom values are following using format (4(ix,f9.1)) which hold the lower left and upper right zoom values in the Radar Coordinate system. Calling this subroutine with imode = 0 reads in all data from the file; calling with imode = 1 reads in only the magnetic declination and antennae locations.

READFL: This subroutine initializes the Radar Data, opens files, gets number of sorties, reads in the bpsfile vitals (runways, specific points, navaids), and the cfg file vitals (Radar origin, labels). It calls the Radar Data reading subroutine using imode = 1, which means initialize mode, as opposed to other imodes which read in one particular sortie's data. The status and existence of the individual files has already been established prior to calling this routine.

READNMTK: This subroutine reads in file segment containing the Nominal Flight Track as defined by the user. The input file segment is in BaseOps format. The user is prompted to type in the filename.

READRAT: This subroutine operates in the following modes:

- IMODE=1: Initialization Mode – The RAT radar data file has already been opened successfully prior to calling this subroutine. The file will be scanned for the total number of sorties. The number of datapoints at each sortie will be checked against the program dimensional limits. For dimensional exceedances, program operation will continue, but a warning will be made.
- IMODE=2: Read The Next Sortie Mode – The sortie will be read into the common block TRKDATA. The pointer positions and other vital statistics are stored in common block INITZ.
- IMODE=3: Scan the file only and position the pointer at the next sortie.
- IMODE=4: Read in all the data for this sortie including time and velocity.

For all modes, the calling subroutines are required to keep track of the NTRK variable inside the TRKDATA common, since in some cases – i.e., file scanning – we may want it to point to the next track; however, in other cases – i.e., data reading – we may want it to point to the data already read into the common.

RODENT: This subroutine sees if there is a mouse installed. The INT initializes the mouse (including turning it OFF) and returns B as the number of buttons. If there is no mouse, there is no tomorrow.

RWYFORM: This subroutine is the Runway listing update form. The user selects the particular runway information via a pull-down listing of runway numbers. The vital runway statistics are then loaded into the spaces on the form. The user may update any or all of the fields including location, label, and ON/OFF status. Once complete the user clicks on OK to confirm the changes, or Cancel to quit.

SAVEFORM: This puts up a form where the user toggles YES/NO to save various files associated with the project. This routine also calls the routines which save the data. This routine also has one extra iWinClose to close the filemgr pull-down menu for the screen dupm save options. The IMODE returns -99 if the user has tried to open an impermissible file and elected to quit out of the program. This routine also includes the output printing options which may be toggled ON and OFF and filenames specified.

SCALEBAR: This subroutine draws a SCALE BAR in the lower left portion of the graphics window. It uses the current ZOOMNPAN characteristics to display feet increments. The criteria for which increments to put onto the scale bar are based on the IRunMode.

SCRNCNTL: This routine contains the screen control options. The IMODE controls what is drawn when the screen is refreshed with the new ZOOMNPAN characteristics:

- IMODE=1: Main View
- IMODE=2: Nominal Track View
- IMODE=3: Edit a Track View

SELECT: This is the main interactive routine which controls user option selection. Options include:

- Initial Gate and flight track selection
- Individual Flight Track modification
- Sub-Gate and Nominal track calculation

Within each of the options the user can zoom and pan, as well as shift between top and side view (tracks versus profiles).

There is a separate interactive routine for each user selection. User selection is controlled by function keys. Key parameters are passed from one routine to the next in order to track current track selection, etc. Basically this routine repeatedly calls the Assembly routines which check the DOS interrupts for user key strokes or mouse button clicks. When it has captured such a command, it goes into the appropriate routine and does its thing. After finishing the specific task, it returns to this routine into the main loop section to once again wait for user key or mouse commands.

SELECTPRN: Routine to select the hardcopy output mode, via a menu. Menu definition file PRTMEN.IFD must be in the executable directory.

SGT8STDR: This subroutine draws the cross-hair symbols at the Mean Sub-Gate penetration locations on the graphics window. The horizontal and vertical cross-hair size is one standard

deviation centered about the mean in the x and y direction. These symbols are drawn in yellow, #14.

SGT8UPDT: This subroutine is the basic sub-gate listing update form. The user selects the particular sub-gate information via a pull-down listing of gate numbers. The vital sub-gate statistics are then loaded into the spaces on the form. The user may update any or all of the fields including location, label, and ON/OFF status. Once complete, the user clicks on OK to confirm the changes, or Cancel to quit.

SPPTFORM: This subroutine opens up a form which allows the user to control the Specific Points ON/OFF Status, the x,y,z values. This routine does not draw anything to the screen.

STATBOX: This subroutine writes the MESSAGE to the status box in the information window on the right side of the screen. It first clears whatever previous message was in the box, and then writes in the new message.

STATWIN: This subroutine writes the MESSAGE to the window status box. The message is written to a newly popped-up window. The user must click on the OK button to exit and continue program execution.

STDEV: This subroutine calculates for gate #IG the mean and standard deviation in the s and z variables from common block GATEDATA, specifically variable PGATE. This routine operates in the following IMODES:

- IMODE=0: As described above for Gates based on GATEDATA.inc.
- IMODE=1: As described above for SUBGATES based on SUBGATE.inc.

STRAIGHT: This subroutine contains the straight segment functions for the user to create a Nominal Track for outputting to a NMT file. When entering this routine the isegon variable is checked. If equal to 1, i.e., the first segment the user is prompted for the runway, etc. Subsequent entries bypass this. The direction of the segment is always tangent to the prior segment, and the interactive mouse following segment drawing indicates this. The heading of the previous segment is entered into this routine. Head is expected in radians, as the result of an ATAN2 call. For times when this is the first call, Head is defined inside here by the GETRUN subroutine. Note: It may be necessary to add at a later date the control of x or y mouse on the final point as a function of Heading Angle. For amost due North or South headings, the sensitivity with x mouse motion seems almost too great. We will leave this as a later program enhancement. This routine contains code which controls I/O in INM format. To invoke, run DISARTS with *filename*.INM in place of *filename*.BPS.

STRTFORM: This routine allows the user to type in the Straight values instead of interactively drawing them in with the mouse.

SUBSET: This allows the user to select a subset of the initial ARTS flight tracks. The selection may include aircraft types and mission start times (day/eve/ night).

When selections in this mode are turned OFF, they will not appear on the radar track graphics area at all. The XRF ON/OFF status flag will be number 2. This means not selectable. The user may re-enter this routine at any time to change the subset selection criteria. After all subset selection criteria have been set, the user may elect to update the selection set. Upon leaving this routine, the selection set is automatically updated.

SUMMARY: This subroutine outputs a summary text file containing all available operations information based on the current ON tracks. The tabulated data includes for all ON flight tracks:

1. Total number of flight tracks containing data.
2. Total number of flight tracks containing 2 or fewer points.
3. Total number of flight tracks by aircraft type.
4. Total number of flight tracks by Day/Evening/Night.
5. Breakdown of flight tracks by aircraft type and time.
6. For ON Gates, total number of flight tracks by aircraft type and time.
7. A listing of the CODE and OPER fields in the ARTS datfile.

SWBORDER: This subroutine sets the basic triple screen layout border color based on the current input IMODE value (abs of imode). This is really iSwitchMode – but needs to be called differently. The right half is divided into three sections: The top part contains the Altitude versus Arc Length profile, the center part contains the Velocity Profile, and the lower part contains the power profile. It leaves the current PG area set to the ON one. The imode controls whether the routine is left in GR or PG units. ABS (IMODE) should = iswitchmode but:

IMODE > 0: leave in PG Mode, with the right color border.

IMODE < 0: leave in GR Mode, do not draw any borders.

The real-world units are stored in zoomnpan commonblock. The radar area is: xTmin, xTmax, yTmin, yTmax.

SWITCH: This routine opens up a form in which the user selects between Profile Modes: Altitude, Velocity, or Power. The form contains three linked buttons. One must be ON and the other two OFF.

TIMESLCT: This subroutine allows the user to select which times are available for track processing. The breakdown is as follows:

DAY:	07:00–19:00
EVENING:	19:00–22:00
NIGHT:	22:00–07:00

This routine allows the user to toggle via mouse on a text screen the particular times ON/OFF. The default is all times ON. After selection, the ARTS file is scanned for all the sortie start times, and those time brackets turned OFF are set to XRF (TRKSTAT) mode 3. This then allows the drawdata routines to skip the draw on those tracks completely. The Selected ON tracks which are later turned OFF will appear brown, while the selected ON tracks will remain red. After leaving this routine, the calling one calls the re-draw routine to reflect the current selections.

TIMEUPDT: This routine updates the XRF file with STATUS=3 depending on the SUBSET selections. It operates in the following modes. This subroutine loops through all the tracks, checking the Subset selections. It then looks at the TIMESTAT, ACSTAT, OPSTAT flag, and initializes the XRF array to 1=ON, or 3=SUBSET OFF dependent on the STAT arrays. The stat arrays contain 0 for OFF which results in XRF array (TRKSTAT)=3, 1 for ON which results in XRF array (TRKSTAT) = 1. The logis is organized thusly: All tracks are turned ON.

Those searches resulting in qualifying matches remain unchanged. Those searches which do not satisfy the search criteria are switched to OFF.

TKEDINIT: This subroutine initializes the data for Track Editing. It copies the current TRKDATA common block data into common TKEDITR. It resets the Graphics portion of the screen to display only the one track being worked on.

TKLBFORM: This routine opens up a form in which the user selects which track labels are ON and OFF.

TRIPLE: This subroutine sets the basic triple screen layout for profile mode: the left half is the radar view screen area complete with flight tracks and profiles. The right half is divided into three sections: The top part contains the Altitude versus Arc Length Profile, the center part contains the Velocity Profile, and the lower part contains the Power Profile. If FIRST = .true. Calculate the data limits. If the user hits escape in the middle of unit calculations, whatever the best values for the number of tracks read already will be used. The real-world units are stored in zoomnpan commonblock. The radar area is: xTmin, xTmax, yTmin, yTmax.

TRKEDIT: This subroutine allows the user to edit via mouse or keyboard one particular flight track. Before going into this routine, only one track is turned ON, all others are OFF. The graphics window as usual encompasses the left square portion of the screen. In this mode, however, only the one operational track is drawn, and the actual data points defining the track are shown as blips. The user may perform the following operations on the single track:

1. Move a point by clicking and dragging to the new location using the mouse.
2. Selecting a point by clicking on it with the mouse, then typing in the new coordinates via the keyboard.
3. Toggle to Profile view and edit points using method 1 or 2.
4. Delete a point from the flight track by clicking on it and confirming with Y.
5. Adding a point within the flight track by clicking on the flight track. The closest perpendicular point from the mouse to the flight track is where the new point will be added, then the user may move that point if desired.
6. Adding a point beyond either end of the flight track. The user will be prompted to click on the end to be extended, and then new points may be added by mouse click location or keyboard typed entry.

This routine calls the initial track drawing routine. It also does the final bookkeeping for saving or deleting the final edited track. All mouse operations show the "current" mouse location in the STATBOX in the Instruction area on the right of the screen.

TRKLOOP: This subroutine lets the user select a subset of all activated tracks based on penetration through current ON gates. This routine loops through all active tracks and flags the selected tracks penetrating the activated gate. This user may spend a considerable amount of time in this subroutine once gates have been defined and tracks have been "cleaned up". Suggested operational strategies include:

1. The creation of several large gates near the outer perimeter of the radar data to break traffic into general directions.
2. Working with a subset from step 1, create smaller gates in a methodical fashion, working from the outside in towards the center.

3. When a final group of "related" tracks have been highlighted, then proceed to calculate the track statistics and nominal flight paths, etc.

WARNING: The Cross-Reference file *.XRF contains pointers to gate indices; the user must use the DISARTS delete gate option to remove any gates from the *.GT8 file. This internal option automatically re-indexes the XRF file to the re-numbered gates. Deleting a gate from the GT8 file using an external editor may cause errors in the XRF file. The exception occurs when only gates have been defined and no track selection or cross-referencing has yet occurred.

TRKSLCT: This subroutine allows the user to pick with the mouse one individual flight track. The track picked will then be toggled to OFF if it was ON, or ON if it was OFF. The screen will be updated only with the new color of the ON/OFF flight track IF THE USER CHANGES THE ON/OFF STATUS.

TRPLGET: This subroutine sets up the Triple Mode screen limits and stores them in the TRPLDAT include file for later use with Profile mode, IRunMode = 4. The values stored in TRPLDAT.inc common blocks are for the use if IGrArea Interacter Routine.

TRPLMOVE: This routine updaes the vertical bar on the other two screens when the mouse moves on the primary one.

VERTBAR: This subroutine updates the vertical interactively moving bars on the "other" triple dat screens. EOR mode is used to clear out the vertical bar at the old location and then a new one is drawn in at the new location. The old location values is passed in as a subroutine parameter value OldValue, and the new one, ValueNew.

WHATANOT: This is the pull-down menu for controlling screen and annotation. Also, the user may update runways, Nav Aids, and specific point parameters within NDADS from options in this routine.

XRFALLON: This subroutine turns ON ALL the flight tracks, independent of any subset selection criteria.

XRFDEL: This subroutine allows the user to delete a gate reference from the XRF file. It prompts in the STATBOX location of the Instructions portion of the TRACK screen for the GATE index number. It also zeroes all penetration statistics for that GATE index.

XRFINIT: This subroutine initializes the cross-reference file or reads in a previously created cross-reference file. The input file name convention is *.XRF, although the user may make the name anything he/she wants. The XRF file contains a master list with each line being a track number, specifically aligned to the *.ART file, and going across is the gate index number through which the track goes. The gate index number is also aligned with the *.GT8 file. So deleting a gate from the GT8 file requires re-indexing all gate indices after the deleted gate. These options are allowed from within DISARTS. If there is no existing input XRF file, the array is initialized to zero (no cross-references). Upon leaving the program, the user will have the option to output this file and specify a filename. The array containing all the cross-reference information is TRKSTAT, from common block TRKDATA.

XRFON: This subroutine goes into the Gate listing section and for all gates who are turned ON, turns ON the tracks with a positive cross-reference to the gate index. Tracks not

containing the ON gate in the cross-reference list will be turned OFF. Running with IMODE = 1 prompts the user to GATEUPDT. Running with IMODE = 0 uses the current GATE ON/OFF status.

XSUBSLCT: This subroutine Subset selects all tracks OFF, then sub-set selects ON only those tracks with positive ON gate/track penetration XRF.

ZOOMFORM: This subroutine allows the user to enter the xxmin, xxmax, and yymax values directly into a form. There is a calculate button for obtaining the last yymax value in order to maintain a 1:1 screen X:Y. Aspect ratio from Interacter routines based on hardware. IERR returns -99 if the user cancels out.

ZOOMIN: This routine operates in the following modes:

- IMODE=1: Allows the user to Zoom in on a mouse-selected box. Since the Drawing window is square, the max delta direction is used as the square side dimension. The square will be aligned with the center of the box selection. This mode is used for zooming on (X,Y) plots.
- IMODE=2: This mode is used for (S,Z) modes. The user is not required to maintain a square grid area.

Before returning to the calling subroutine, this subroutine refreshes the screen and redraws with all current selections and new zoom mode.

ZOOMOUT: This subroutine doubles the current zoom size and zooms out.

- IMODE=1: (X,Y) drawing mode, use common ZOOMNPAN
- IMODE=2: (S,Z) drawing mode, use common TKEDITR

Appendix B

Sample Reports

1.	RAT Summary	file:	Shaw96.LST
2.	OPS Summary	file:	Shaw96.OPS
3.	NMT Summary	file:	Shaw96.NTD
4.	Histogram	file:	Shaw96.HTG
5.	Profile Report	file:	Shaw96.PRO

B.1 RAT Summary File:

Arts File CODE & OPER label field Dump:

INDX	BEAC	TYPE	Date	Rnwy	Oper	Call	# AC	User	code	npts	Strt	End	Xloc	Yloc	Alt	Knot	Powr	S
1	OGEO	____	ßÿÿÿÿ¬ðÁ	!___	°ÿÿÿ	:____•KA	*****	_____ ÀOPER____	876033331	27	85223.0	85367.0	222917.3	240006.7	7400.0	268.4	0.0	0.0
2	4111		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	6	56958.0	56991.0	-158437.9	-302406.7	15954.5	650.2	0.0	0.0
3	2075		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	16	56930.0	57014.0	-348618.0	89239.6	8000.0	222.2	0.0	0.0
4	667		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	24	56941.0	57081.0	199372.9	-189118.7	13800.0	730.7	0.0	0.0
5	2353		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
6	673	F16	19970414	04L	Arri	BULET33B	1	IIIIIIIIIIIIIII	1835365491	18	56943.0	57144.0	-10253.4	-2658.4	4246.9	499.7	0.0	0.0
7	1117		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
8	734		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	33	56932.0	57269.0	-249502.4	195952.3	9500.0	215.5	0.0	0.0
9	3113		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
10	2733		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
11	3057		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	53	56934.0	57397.0	40254.2	224056.8	19000.0	576.5	0.0	0.0
12	1004	PO	19970414		Over	PDT B	1	IIIIIIIIIIIIIII	1835365491	81	56976.0	57454.0	76710.9	251019.5	10100.0	343.1	0.0	0.0
13	531		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	110	56921.0	57552.0	235069.7	52027.0	1900.0	231.9	0.0	0.0
14	4123		19970414	05	Arri	B	1	IIIIIIIIIIIIIII	1835365491	98	56937.0	57505.0	-144360.1	136921.2	9800.9	481.1	0.0	0.0
15	5325		19970414	04L	Arri	HTR91 B	1	IIIIIIIIIIIIIII	1835365491	96	56935.0	57499.0	-9494.4	42912.5	2500.0	518.5	0.0	0.0
16	5330		19970414		Over	VMYW05 B	1	IIIIIIIIIIIIIII	1835365491	80	56930.0	57596.0	13671.2	66837.3	3163.6	289.1	0.0	0.0
17	2421		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	34	57293.0	57579.0	209246.9	-296020.3	19900.0	1475.6	0.0	0.0
18	742		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
19	2101		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	119	56934.0	57786.0	168612.1	163295.7	10000.0	302.3	0.0	0.0
20	2145		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
21	5326	PA28	19970414		Over	N3810M B	1	IIIIIIIIIIIIIII	1835365491	80	56938.0	57720.0	-41394.7	110129.2	1100.0	183.4	0.0	0.0
22	4120		19970414		Over	PO B	1	IIIIIIIIIIIIIII	1835365491	104	57177.0	57780.0	3529.6	-35824.5	19789.2	554.4	0.0	0.0
23	3130		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
24	4147		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	115	56957.0	57651.0	119243.7	207727.3	9150.6	287.2	0.0	0.0
25	1027		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	15	57623.0	57693.0	319755.6	-30380.2	13000.0	583.9	0.0	0.0
26	120		19970414	04L	Arri	MACE1 B	1	IIIIIIIIIIIIIII	1835365491	170	56925.0	57900.0	-36455.7	-115826.3	2300.0	454.3	0.0	0.0
27	6623		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	83	57362.0	57855.0	-291655.5	203167.2	17818.0	758.9	0.0	0.0
28	243		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	81	57446.0	57903.0	-94560.1	60000.7	1600.0	273.2	0.0	0.0
29	2777		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	46	57469.0	57719.0	-210383.9	-185323.3	6400.0	297.3	0.0	0.0
30	3131		19970414	05	Arri	B	1	IIIIIIIIIIIIIII	1835365491	58	57593.0	57953.0	-357351.2	-40257.6	10898.6	619.8	0.0	0.0
31	450		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	29	57757.0	57944.0	28862.5	-358870.5	3200.0	166.0	0.0	0.0
32	224		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	20	57770.0	57878.0	-353553.4	-58485.9	3600.0	144.4	0.0	0.0
33	7020		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	207	56926.0	58099.0	124180.6	-23924.5	18000.0	331.9	0.0	0.0
34	4344		19970414	05	Arri	B	1	IIIIIIIIIIIIIII	1835365491	204	56926.0	58127.0	-113545.1	-274185.6	4100.0	354.6	0.0	0.0
35	3144		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	189	56935.0	58015.0	-18988.6	78609.6	16000.0	432.2	0.0	0.0
36	3345		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
37	2135		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
38	3064		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	124	57377.0	58155.0	-334185.1	-143171.5	15100.0	332.2	0.0	0.0
39	5332		19970414		Over	N6093D B	1	IIIIIIIIIIIIIII	1835365491	101	57459.0	58085.0	48988.7	14430.8	926.7	147.0	0.0	0.0
40	5255		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	48	57645.0	58054.0	247601.6	146206.7	2600.0	359.4	0.0	0.0
41	2411	F16	19970414		Over	MACE71 B	1	IIIIIIIIIIIIIII	1835365491	37	57793.0	58117.0	-215306.5	-85154.2	13484.7	815.5	0.0	0.0
42	746		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	24	57912.0	58075.0	165953.8	284818.0	7700.0	279.9	0.0	0.0
43	242		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	164	56980.0	58278.0	-195954.4	-32281.1	3300.0	232.2	0.0	0.0
44	2117		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	170	57182.0	58333.0	279880.9	231272.3	10000.0	180.2	0.0	0.0
45	452		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	44	57477.0	58224.0	-31517.8	-253298.3	3400.0	135.3	0.0	0.0
46	1056		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
47	2447		19970414		Over	B	1	IIIIIIIIIIIIIII	********	0								
48	245		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	43	58045.0	58324.0	-164815.6	96077.0	2400.0	137.9	0.0	0.0
49	246		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	32	58089.0	58243.0	-158358.8	6454.5	1700.0	294.4	0.0	0.0
50	3171		19970414		Over	B	1	IIIIIIIIIIIIIII	1835365491	279	56932.0	58517.0	-131777.3	155319.5	6000.0	285.7	0.0	0.0

B.2 OPS Summary File:

```
SUMMARY SHEET FOR ARTS FILE:SHAW96A.RAT

SUBSET SELECTIONS AS FOLLOWS:
 Interval        Start Time      End Time        Status
  Day             07:00           19:00           ON
  Evening         19:00           22:00           ON
  Night           22:00           07:00           ON

 AC Type     Status
               ON
  F16          ON
  C12          ON

 Operation Type    Status
 Arri                ON
 Depa                ON
 Over                ON
                     OFF
                     OFF

Total number ARTS tracks =          16

 SUMMARY data for ON tracks & Gates
 Total number ARTS tracks in SUMMARY          16
 Total number ON tracks with >2 points          16
 Total number ON tracks with <2 points           0

 Output by Time
DAY      07:00 - 19:00          0  Sorties
EVENING  19:00 - 22:00          5  Sorties
NIGHT    22:00 - 07:00         11  Sorties

 Output by Aircraft Type
 Aircraft Type  Number of Sorties   Number of Arcraft
                           2                2
   F16                    13               13
   C12                     1                1

 Output by Aircraft:  Sorties/Aircraft Type by Time
 Aircraft Type      DAY          EVE          NIGHT        TOTAL
                   0 /   0      1 /   1      1 /   1        2
   F16             0 /   0      3 /   3     10 /  10       13
   C12             0 /   0      1 /   1      0 /   0        1
```

Grand Total Number Sorties= 16.000000
Grand Total Number of Aircraft= 16.000000
SUMMARY SHEET FOR ARTS FILE:
Shaw96.RAT

ZULU offset from RAT file= 18000.00

SUBSET SELECTIONS AS FOLLOWS:

Interval	Start Time	End Time	Status
Day	07:00	19:00	ON
Evening	19:00	22:00	ON
Night	22:00	07:00	ON

AC Type	Status
	OFF
F16	ON
PO	ON
PA28	ON
PA60	ON
CHS	ON
C12	ON
C152	ON
PASE	ON
WW24	ON
BE20	ON
C182	ON
C340	ON
PAYE	ON
BE55	ON
PA34	ON
C335	ON
C310	ON
C421	ON
BE90	ON
EH60	ON
C130	ON
PA31	ON
T34	ON
PA24	ON
AGS	ON
PA32	ON
BE36	ON
C208	ON

Operation Type	Status
Arri	OFF
Depa	ON

Over OFF
OFF
OFF

Total number ARTS tracks = 624

SUMMARY data for ON tracks & Gates
Total number ARTS tracks in SUMMARY 10
Total number ON tracks with >2 points 10
Total number ON tracks with <2 points 0

Output by Time

DAY	07:00 - 19:00	5	Sorties
EVENING	19:00 - 22:00	5	Sorties
NIGHT	22:00 - 07:00	0	Sorties

Output by Aircraft Type

Aircraft Type	Number of Sorties	Number of Aircraft
F16	9	9
PO	0	0
PA28	0	0
PA60	0	0
CHS	0	0
C12	1	1
C152	0	0
PASE	0	0
WW24	0	0
BE20	0	0
C182	0	0
C340	0	0
PAYE	0	0
BE55	0	0
PA34	0	0
C335	0	0
C310	0	0
C421	0	0
BE90	0	0
EH60	0	0
C130	0	0
PA31	0	0
T34	0	0
PA24	0	0
AGS	0	0
PA32	0	0
BE36	0	0
C208	0	0

Output by Aircraft: Sorties/Aircraft Type by Time

Aircraft Type	DAY	EVE	NIGHT	TOTAL
F16	4 / 4	5 / 5	0 / 0	9
PO	0 / 0	0 / 0	0 / 0	0
PA28	0 / 0	0 / 0	0 / 0	0
PA60	0 / 0	0 / 0	0 / 0	0
CHS	0 / 0	0 / 0	0 / 0	0
C12	1 / 1	0 / 0	0 / 0	1
C152	0 / 0	0 / 0	0 / 0	0
PASE	0 / 0	0 / 0	0 / 0	0
WW24	0 / 0	0 / 0	0 / 0	0
BE20	0 / 0	0 / 0	0 / 0	0
C182	0 / 0	0 / 0	0 / 0	0
C340	0 / 0	0 / 0	0 / 0	0
PAYE	0 / 0	0 / 0	0 / 0	0
BE55	0 / 0	0 / 0	0 / 0	0
PA34	0 / 0	0 / 0	0 / 0	0
C335	0 / 0	0 / 0	0 / 0	0
C310	0 / 0	0 / 0	0 / 0	0
C421	0 / 0	0 / 0	0 / 0	0
BE90	0 / 0	0 / 0	0 / 0	0
EH60	0 / 0	0 / 0	0 / 0	0
C130	0 / 0	0 / 0	0 / 0	0
PA31	0 / 0	0 / 0	0 / 0	0
T34	0 / 0	0 / 0	0 / 0	0
PA24	0 / 0	0 / 0	0 / 0	0
AGS	0 / 0	0 / 0	0 / 0	0
PA32	0 / 0	0 / 0	0 / 0	0
BE36	0 / 0	0 / 0	0 / 0	0
C208	0 / 0	0 / 0	0 / 0	0

Grand Total Number Sorties= 10
Grand Total Number of Aircraft= 10
SUMMARY SHEET FOR ARTS FILE:
Shaw96.RAT

ZULU offset from RAT file= 18000.00

SUBSET SELECTIONS AS FOLLOWS:

Interval	Start Time	End Time	Status
Day	07:00	19:00	ON
Evening	19:00	22:00	ON
Night	22:00	07:00	ON

AC Type	Status
	OFF
F16	ON
PO	ON

PA28	ON
PA60	ON
CHS	ON
C12	ON
C152	ON
PASE	ON
WW24	ON
BE20	ON
C182	ON
C340	ON
PAYE	ON
BE55	ON
PA34	ON
C335	ON
C310	ON
C421	ON
BE90	ON
EH60	ON
C130	ON
PA31	ON
T34	ON
PA24	ON
AGS	ON
PA32	ON
BE36	ON
C208	ON

Operation Type	Status
Arri	OFF
Depa	ON
Over	OFF
	OFF
	OFF

Total number ARTS tracks = 624

SUMMARY data for ON tracks & Gates

Total number ARTS tracks in SUMMARY	507
Total number ON tracks with >2 points	507
Total number ON tracks with <2 points	117

Output by Time

DAY	07:00 - 19:00	288	Sorties
EVENING	19:00 - 22:00	177	Sorties
NIGHT	22:00 - 07:00	42	Sorties

Output by Aircraft Type

Aircraft Type	Number of Sorties	Number of Aircraft
F16	34	34
PO	1	1
PA28	1	1
PA60	1	1
CHS	1	1
C12	2	2
C152	1	1
PASE	2	2
WW24	1	1
BE20	2	2
C182	3	3
C340	1	1
PAYE	2	2
BE55	3	3
PA34	1	1
C335	1	1
C310	3	3
C421	3	3
BE90	1	1
EH60	2	2
C130	1	1
PA31	2	2
T34	1	1
PA24	2	2
AGS	1	1
PA32	1	1
BE36	2	2
C208	4	4

Output by Aircraft: Sorties/Aircraft Type by Time

Aircraft Type	DAY	EVE	NIGHT	TOTAL
F16	13 / 13	20 / 20	1 / 1	34
PO	1 / 1	0 / 0	0 / 0	1
PA28	1 / 1	0 / 0	0 / 0	1
PA60	1 / 1	0 / 0	0 / 0	1
CHS	1 / 1	0 / 0	0 / 0	1
C12	2 / 2	0 / 0	0 / 0	2
C152	1 / 1	0 / 0	0 / 0	1
PASE	2 / 2	0 / 0	0 / 0	2
WW24	1 / 1	0 / 0	0 / 0	1
BE20	2 / 2	0 / 0	0 / 0	2
C182	3 / 3	0 / 0	0 / 0	3
C340	1 / 1	0 / 0	0 / 0	1
PAYE	1 / 1	1 / 1	0 / 0	2
BE55	2 / 2	1 / 1	0 / 0	3
PA34	1 / 1	0 / 0	0 / 0	1

C335	1 / 1	0 / 0	0 / 0	1
C310	1 / 1	2 / 2	0 / 0	3
C421	2 / 2	1 / 1	0 / 0	3
BE90	1 / 1	0 / 0	0 / 0	1
EH60	2 / 2	0 / 0	0 / 0	2
C130	1 / 1	0 / 0	0 / 0	1
PA31	1 / 1	1 / 1	0 / 0	2
T34	1 / 1	0 / 0	0 / 0	1
PA24	1 / 1	1 / 1	0 / 0	2
AGS	1 / 1	0 / 0	0 / 0	1
PA32	0 / 0	1 / 1	0 / 0	1
BE36	0 / 0	2 / 2	0 / 0	2
C208	0 / 0	3 / 3	1 / 1	4

Grand Total Number Sorties= 507

Grand Total Number of Aircraft= 507

B.3 NMT Summary File:

```
tst2 04L   1    5    0
       52785   0.00       15000 180.00       62725   0.00       15000 180.00       9939   0.00
tst2       1   -1    0

tst3       2   -1    0

tst4 04L   2    9    0
       38307   0.00        7388 -93.74       12610   0.00        2565 -45.54       14988  40.77       11066 -39.55
21077   0.00       86255 -12.20       18780   0.00
```

B.4 HTG Summary File:

```
 Gate # #  1   (XYZ)1:    32344.00     15115.00         0.00
               (XYZ)2:    33631.00     31610.00     10000.00   S:    16545.13

Mean (S,Z):         0.00          0.00 St. Dev (S,Z):          0.00          0.00

Number of Gate Penetrations
ACTYPE   #Sorties  #AC  #Tracks   TrackID    X          Y          Z          S       ArcL  filename
Totals:       0       0       0

 Gate # #  4   (XYZ)1:    39986.00     -5762.00         0.00
               (XYZ)2:    68075.00       497.00     35000.00   S:    28777.89

Mean (S,Z):      15587.50       7070.62 St. Dev (S,Z):       8741.30       3428.53

Number of Gate Penetrations
ACTYPE   #Sorties  #AC  #Tracks   TrackID    X          Y          Z          S       ArcL  filename
Totals:      33       9      33

 Gate # #  5   (XYZ)1:    48419.00     30966.00         0.00
               (XYZ)2:    38906.00     16856.00     35000.00   S:    17017.32

Mean (S,Z):      10146.26       6728.68 St. Dev (S,Z):       4279.12       1249.72

Number of Gate Penetrations
ACTYPE   #Sorties  #AC  #Tracks   TrackID    X          Y          Z          S       ArcL  filename
Totals:      33       9      33

 Gate # #  6   (XYZ)1:    59914.00     19440.00         0.00
               (XYZ)2:    39897.00      8311.00     35000.00   S:    22902.73

Mean (S,Z):      13237.87       6361.87 St. Dev (S,Z):       9468.57       2899.83

Number of Gate Penetrations
ACTYPE   #Sorties  #AC  #Tracks   TrackID    X          Y          Z          S       ArcL  filename
Totals:      33       9      33

 Gate # # 12   (XYZ)1:    14132.00     21825.00         0.00
               (XYZ)2:    24636.00     11689.00     35000.00   S:    14597.00

Mean (S,Z):       7094.01       2909.88 St. Dev (S,Z):        686.45        541.75
```

Number of Gate Penetrations

ACTYPE	#Sorties	#AC	#Tracks	TrackID	X	Y	Z	S	ArcL	filename
F16	8	8	8							
				276	19109.0	17022.3	2873.4	6916.4	0.000000	IIIIIIII.414
				306	18908.1	17216.3	2604.7	6637.1	0.000000	IIIIIIII.414
				314	18496.6	17613.3	2611.5	6065.3	0.000000	IIIIIIII.414
				388	19220.1	16915.1	4125.1	7070.8	0.000000	IIIIIIII.414
				392	19395.6	16745.8	3496.1	7314.6	0.000000	IIIIIIII.414
				399	19613.2	16535.8	2690.2	7617.1	0.000000	IIIIIIII.414
				420	20259.5	15912.1	2584.9	8515.2	0.000000	IIIIIIII.414
				464	19125.3	17006.6	2604.5	6939.0	0.000000	IIIIIIII.414
C12	1	1	1							
				91	19004.2	17123.5	2598.4	6770.7	0.000000	IIIIIIII.414
Totals:	33	9	33							

B.5 PRO Summary File:

```
     2  4111         19970414           Over          B       1  IIIIIIIIIIIIIIII    1835365491              6
     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
 15954.5, 16167.4, 15933.0, 15603.7, 15300.0, 15100.0,
     3  2075         19970414           Over          B       1  IIIIIIIIIIIIIIII    1835365491             16
     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
0.0,     0.0,     0.0,
  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,  8000.0,
8000.0,  8000.0,  8000.0,
     4   667         19970414           Over          B       1  IIIIIIIIIIIIIIII    1835365491             24
     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
 13800.0, 13794.5, 13824.0, 13939.9, 13947.3, 13980.9, 13992.6, 14000.2, 14000.8, 14001.0, 14000.4, 13991.1, 14011.4,
14030.4, 14034.8, 14017.8, 14040.5, 14079.2, 14092.0, 14099.0, 14111.9, 14105.6, 14100.0, 14000.0,
     6   673  F16    19970414     04L    Arri  BULET33B       1  IIIIIIIIIIIIIIII    1835365491             18
     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
0.0,     0.0,     0.0,     0.0,     0.0,
  4246.9,  4554.4,  4434.0,  4082.9,  3784.5,  3442.0,  3070.3,  2734.5,  2566.6,  2447.9,  2330.6,  2074.9,  1976.5,
1931.3,  1793.8,  1543.1,   800.0,   800.0,
     8   734         19970414           Over          B       1  IIIIIIIIIIIIIIII    1835365491             33
     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
0.0,     0.0,     0.0,     0.0,     0.0,     0.0,     0.0,
  9500.0,  9500.0,  9500.0,  9500.0,  9500.0,  9500.0,  9500.0,  9500.0,  9500.0,  9493.6,  9499.3,  9512.8,  9587.9,
9593.4,  9666.7,  9539.5,  9226.3,  9099.5,  9355.7,  9453.0,  9494.8,  9519.0,  9542.2,  9580.8,  9589.5,  9545.3,
9518.2,  9506.6,  9492.8,  9496.6,  9499.4,  9500.0,  9500.0,
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Figures

This section includes the figures that illustrate the screens used in the NDADS system.

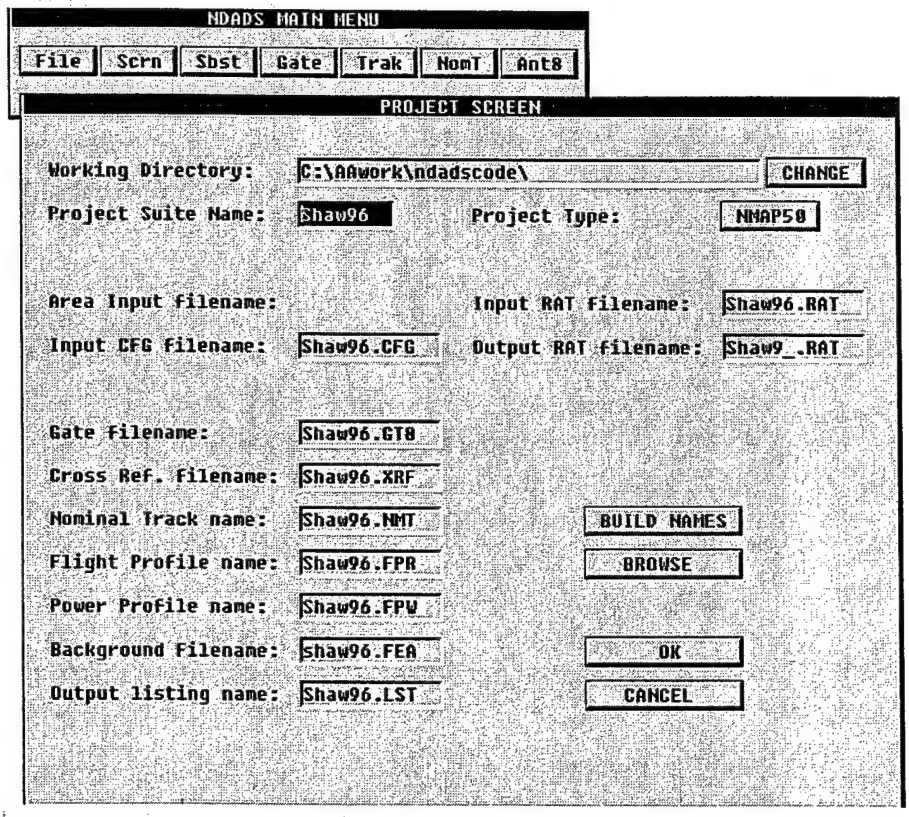

Figure 1. Project Screen

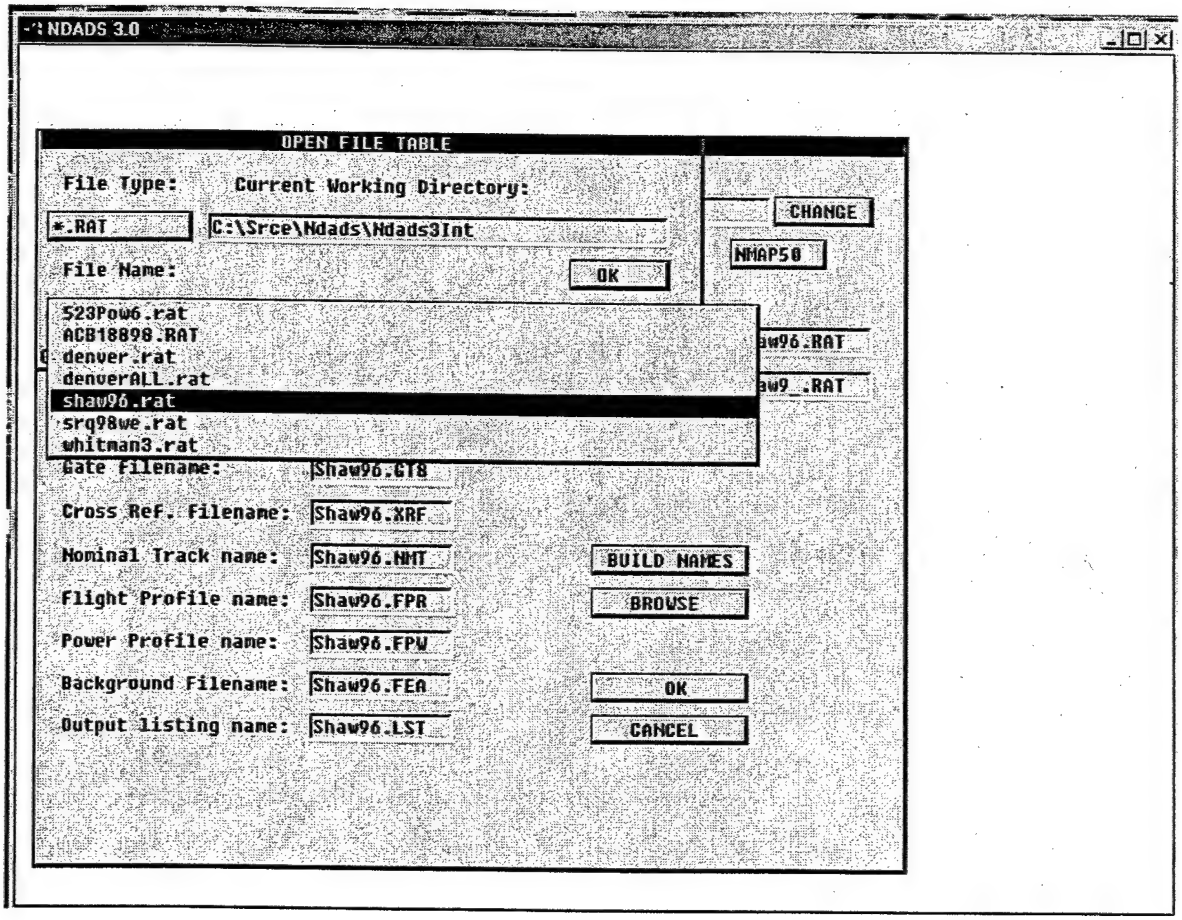

Figure 2. Browse for a File Menu

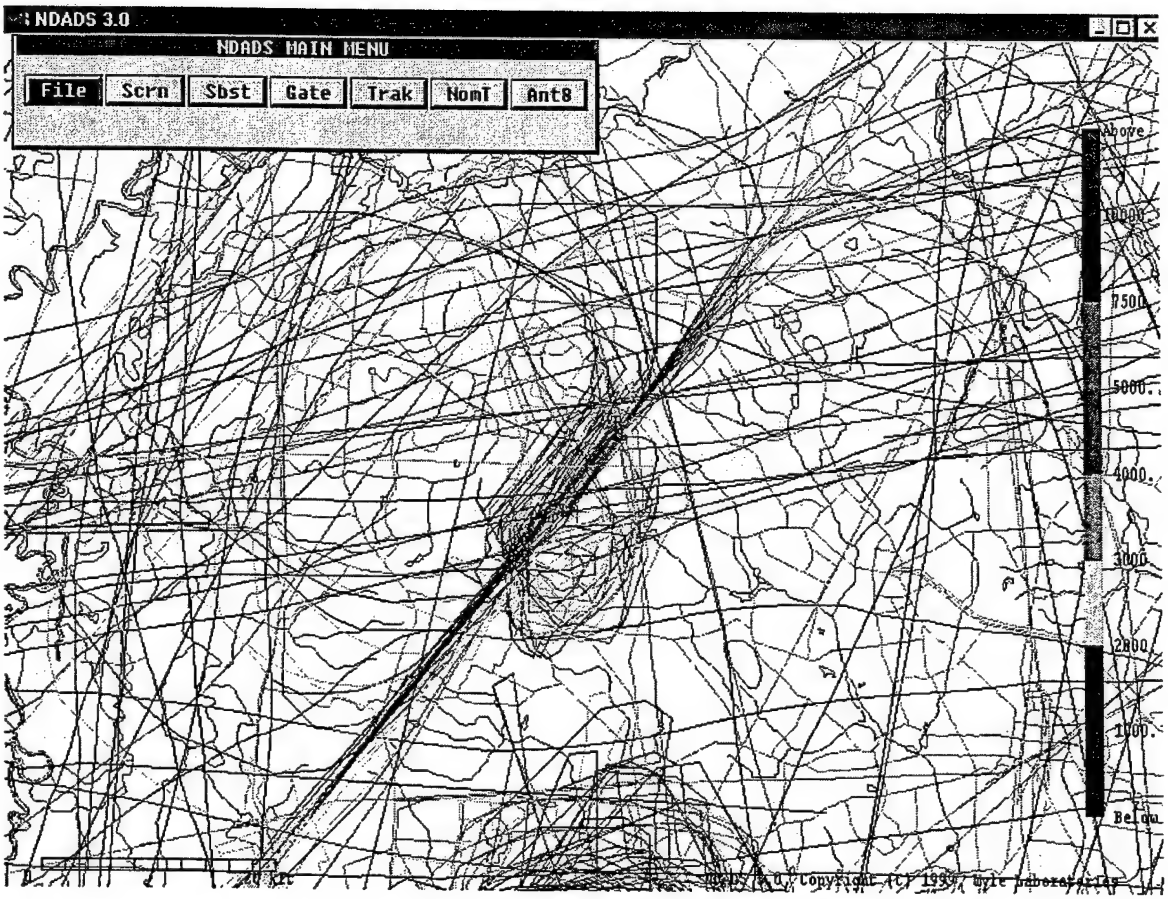

Figure 3. Radar Screen

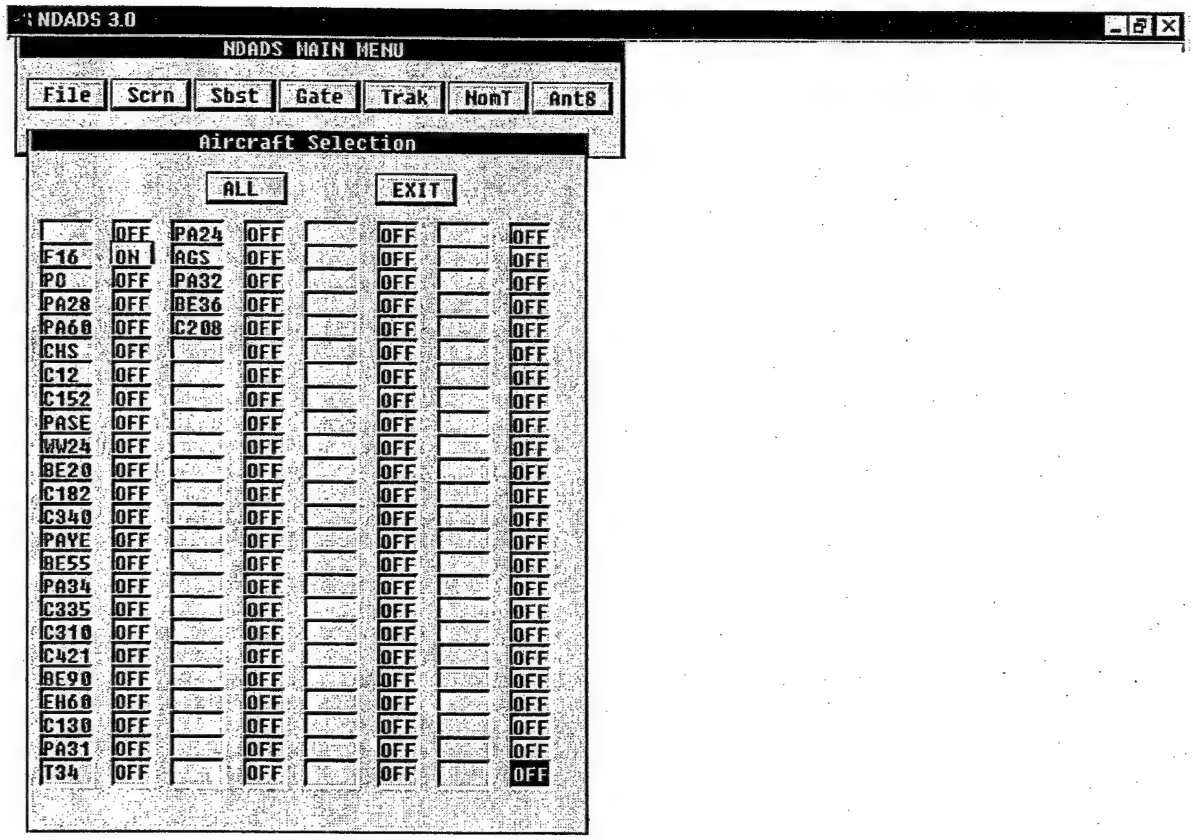

Figure 4. Aircraft Selection Menu

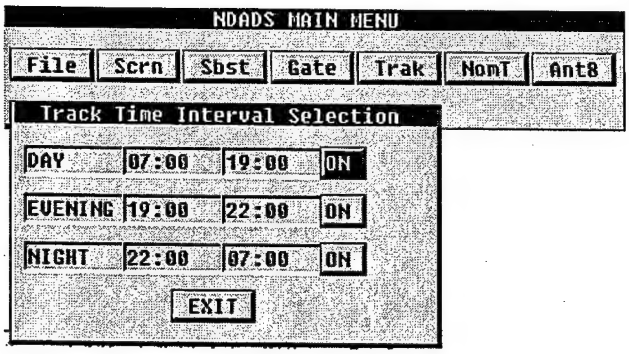

Figure 5. Track Time Interval Selection

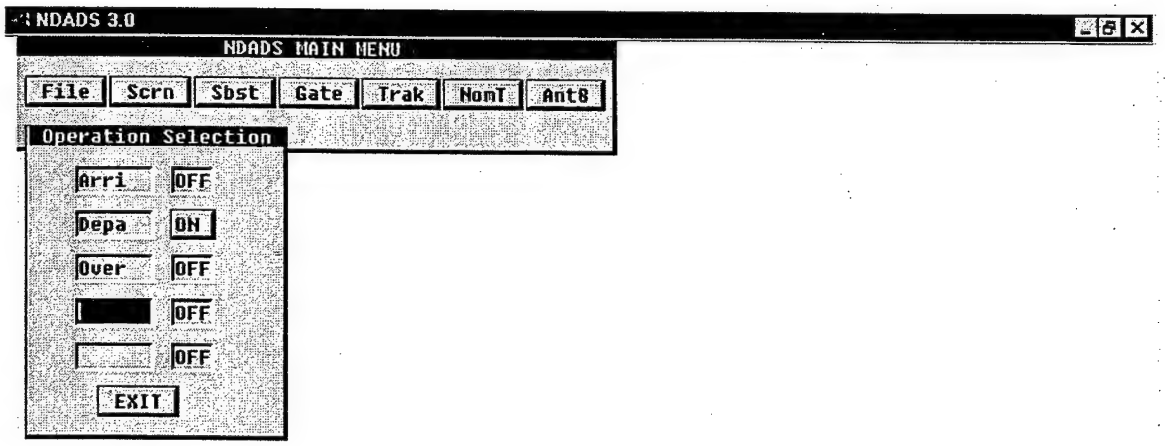

Figure 6. Operation Selection

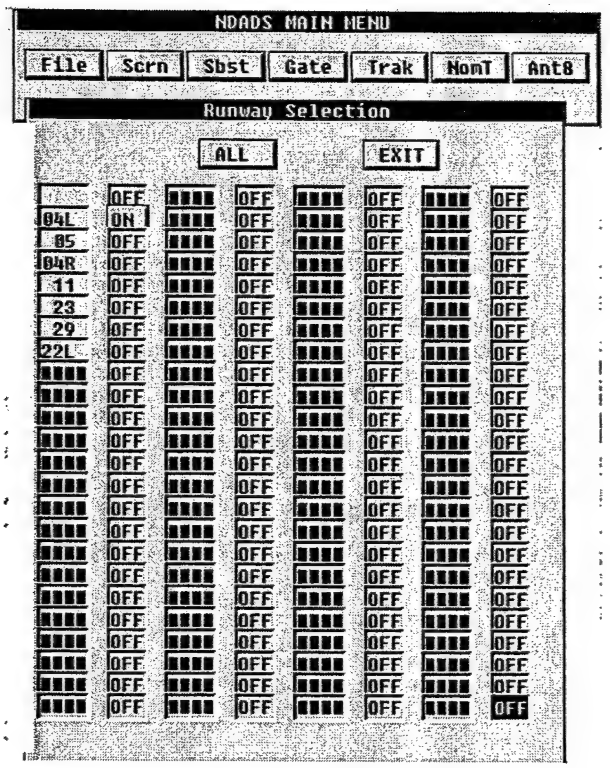

Figure 7. Runway Selection Form

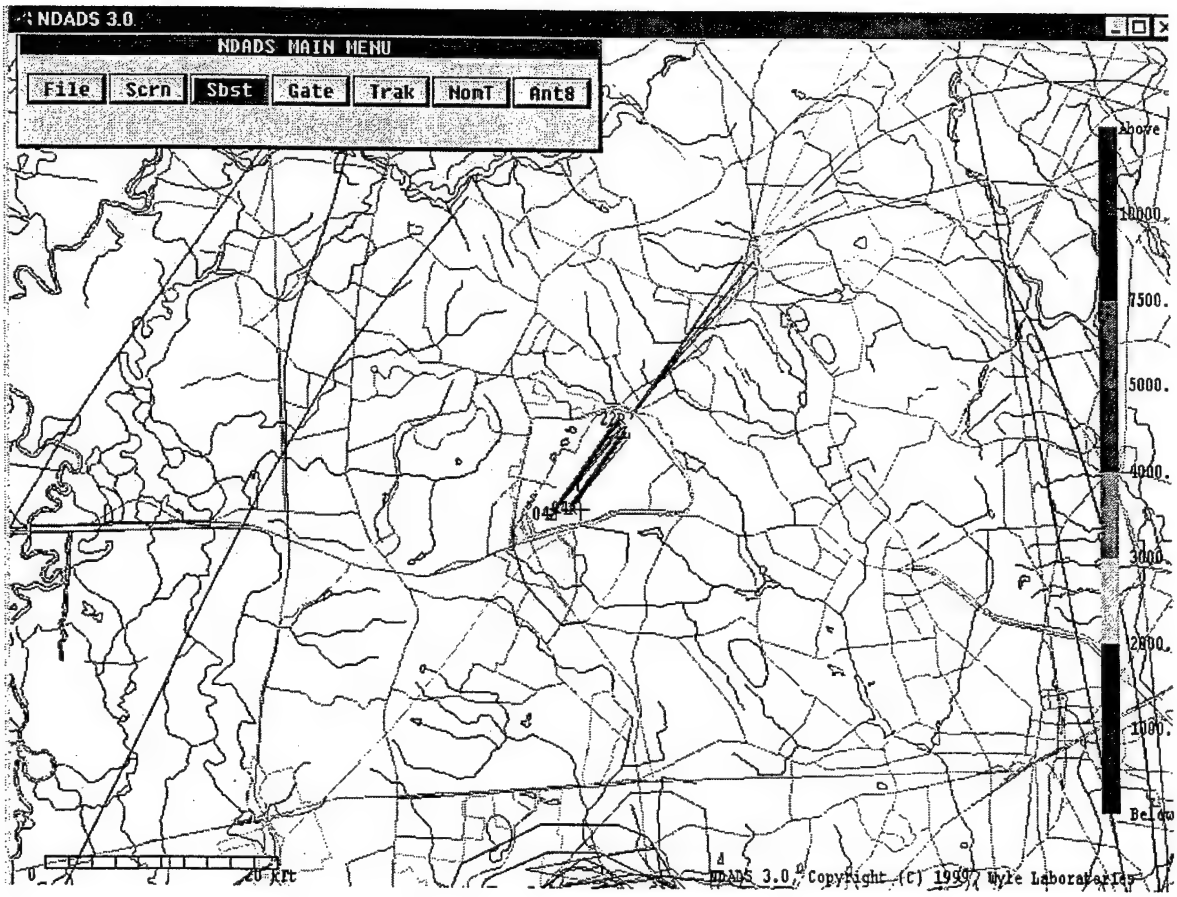

Figure 8. Filtered Radar Data

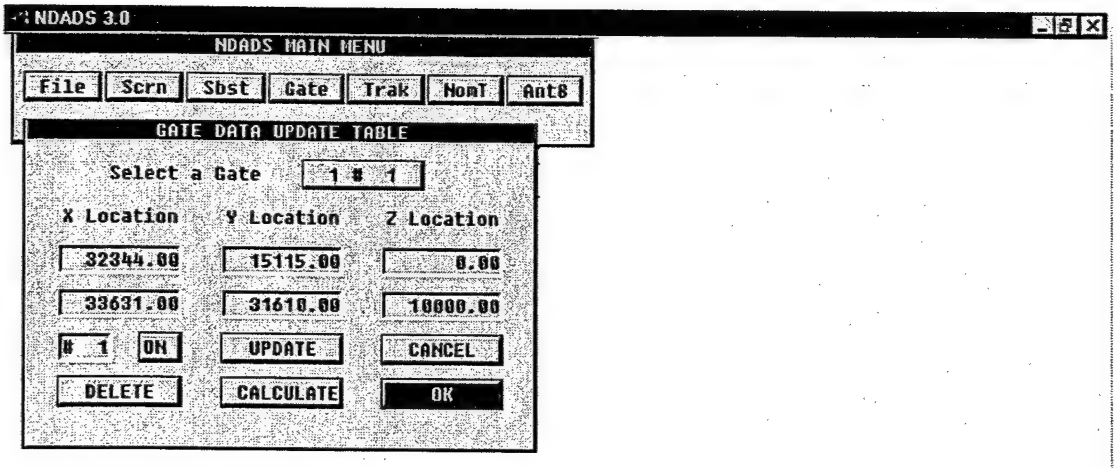

Figure 9. Gate Data Update Table

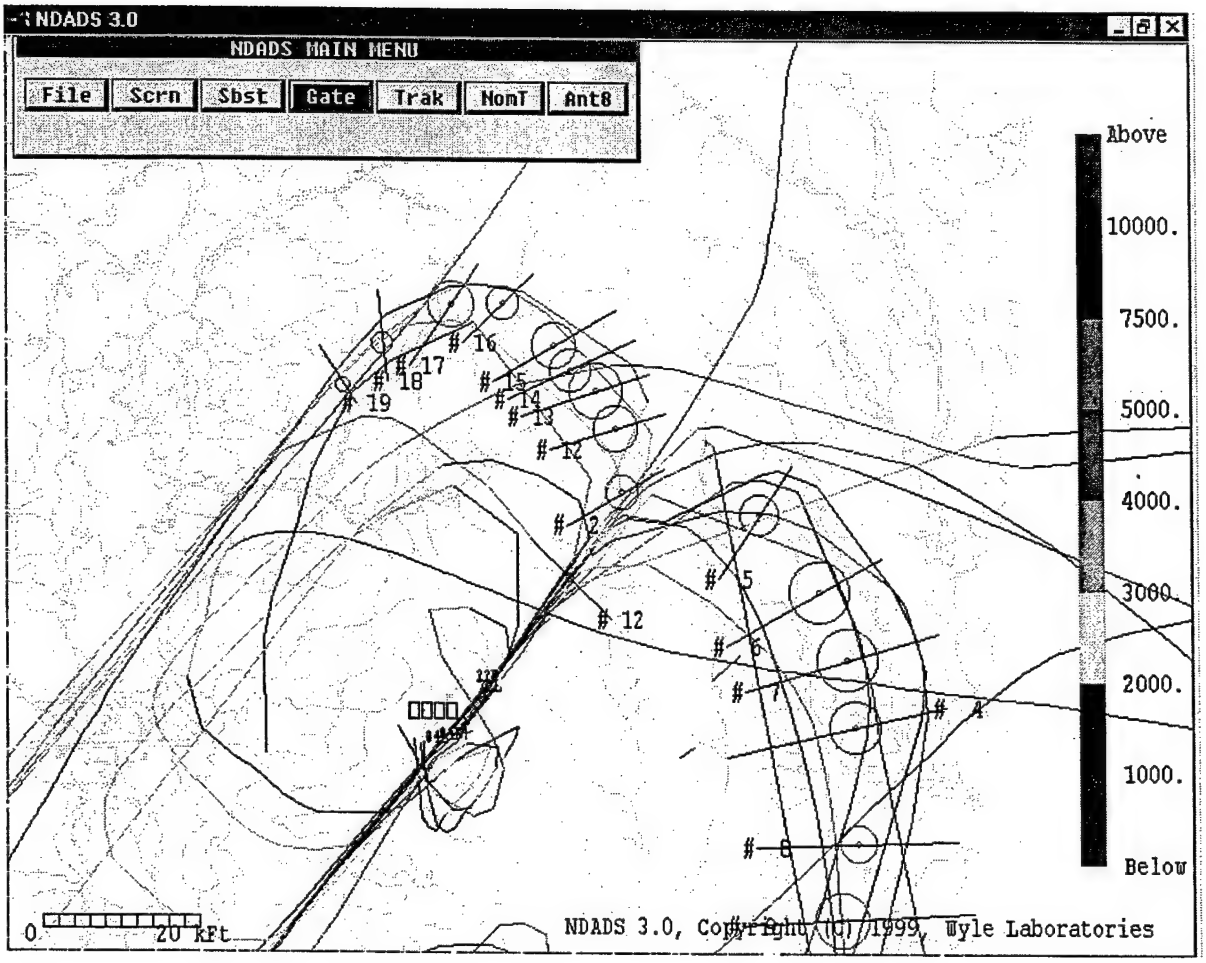

Figure 10. Calculated Gates

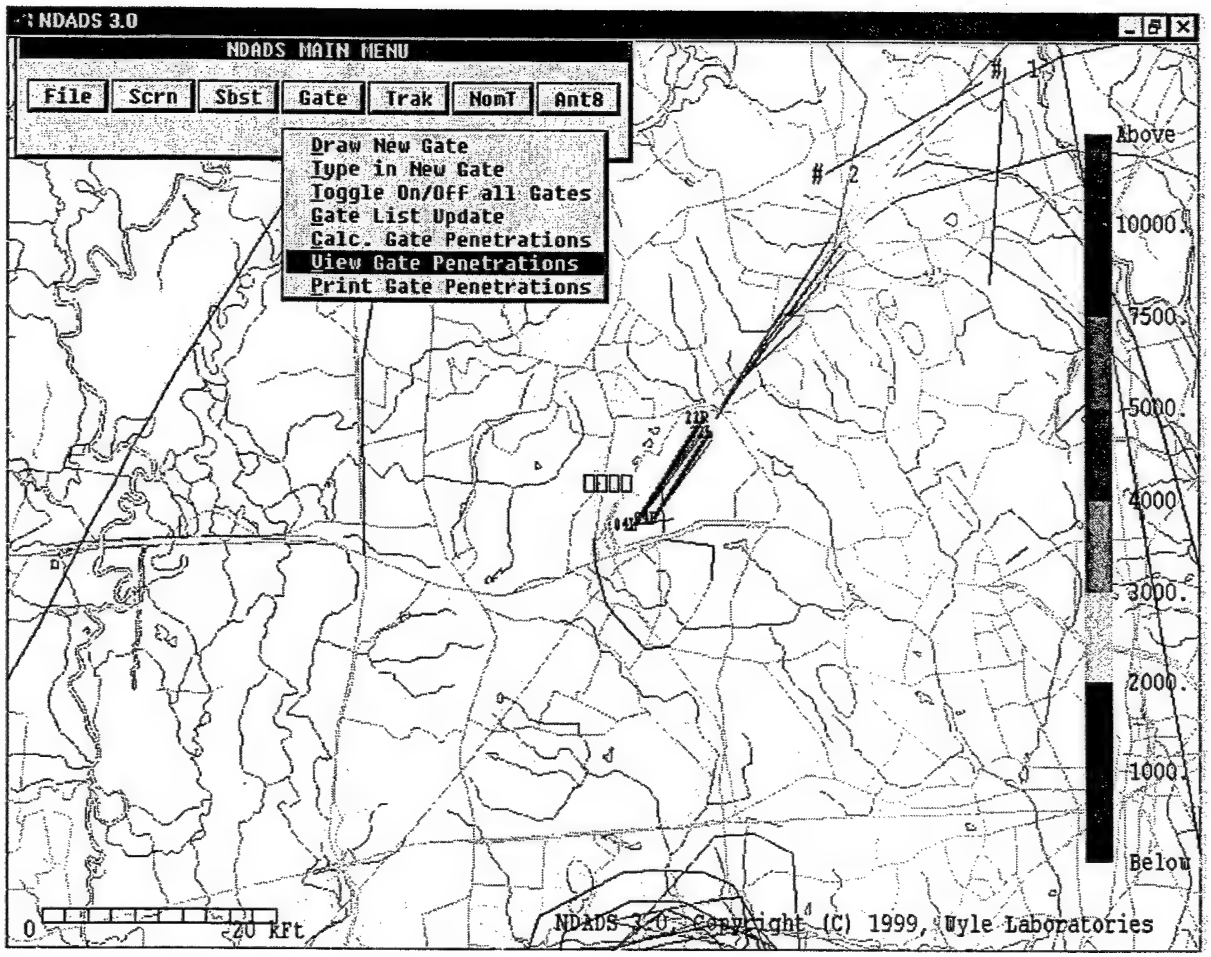

Figure 11. View Gate Penetrations

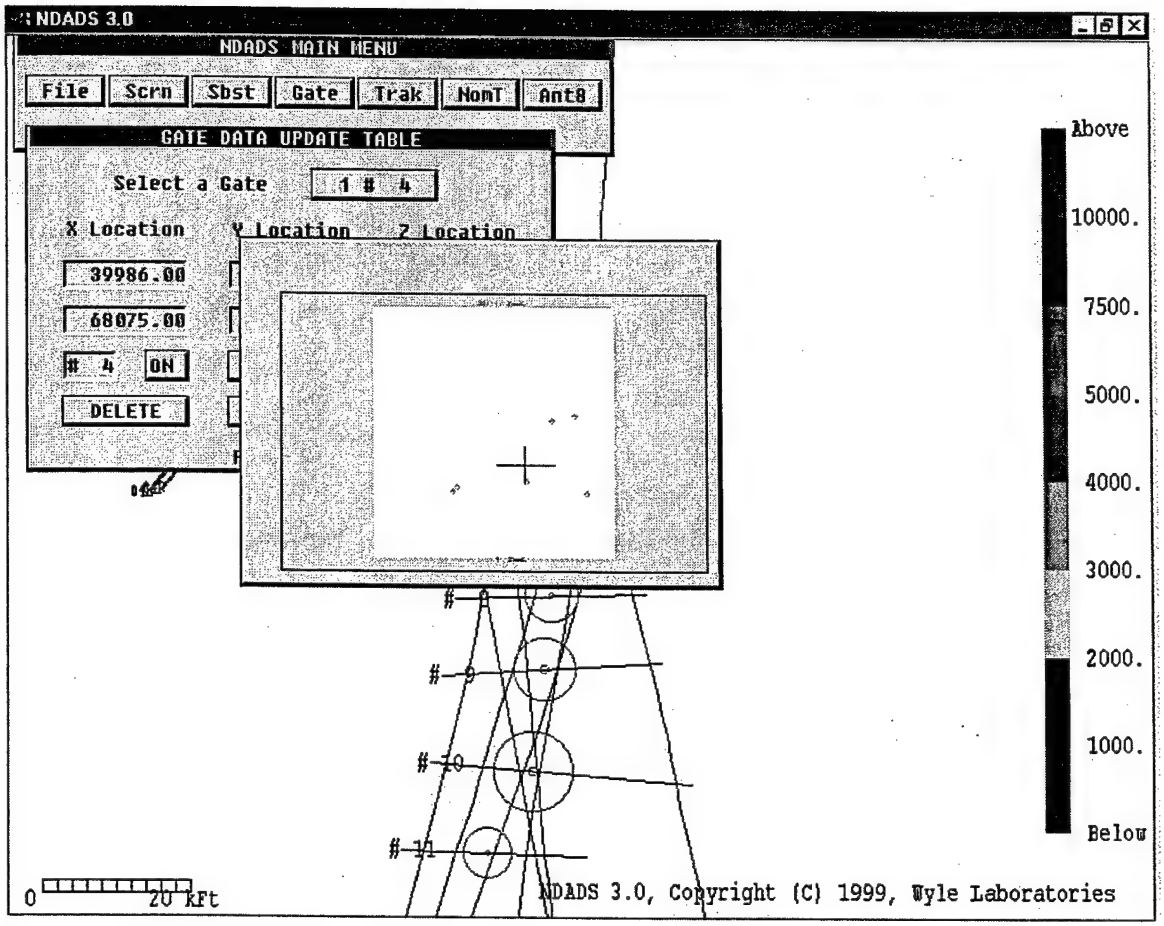

Figure 12. View Gate Penetrations Window

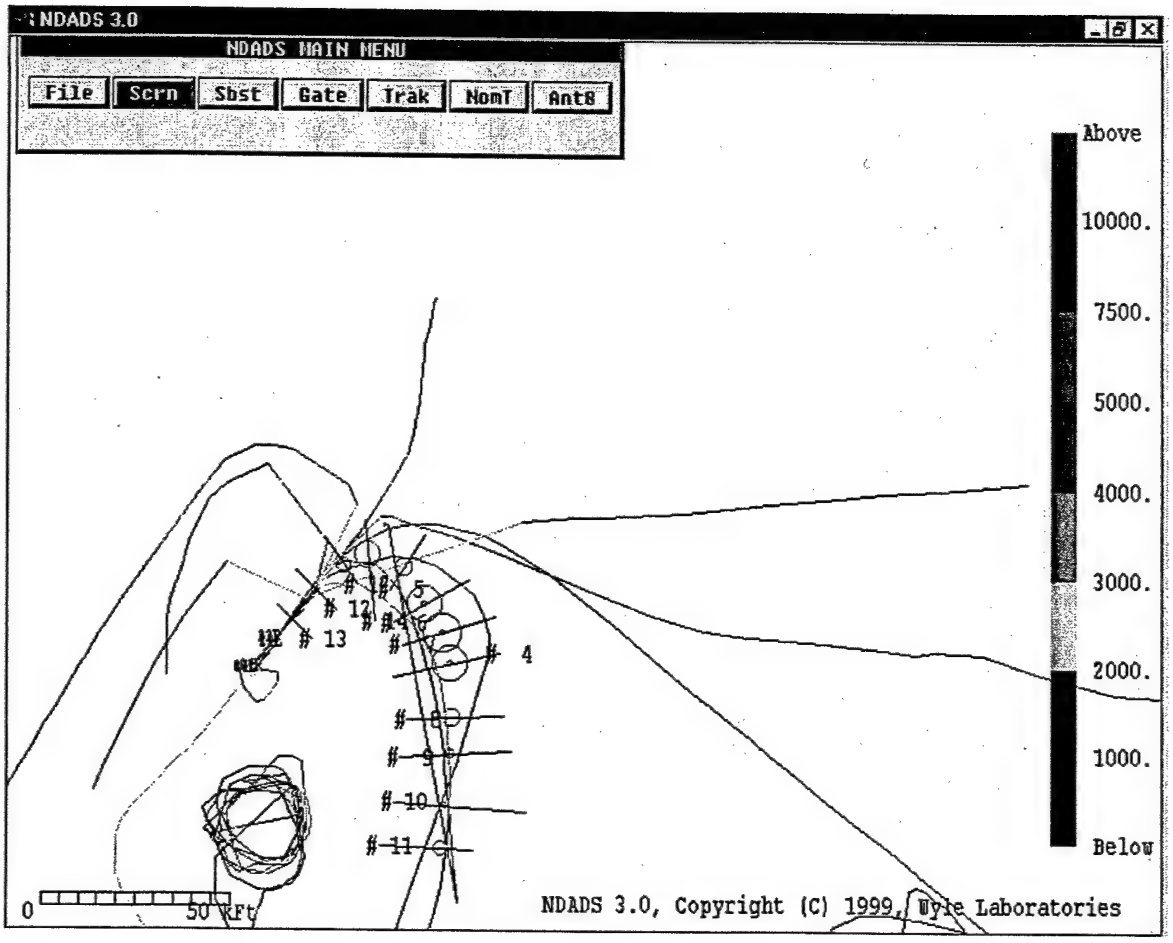

Figure 13. Gate Penetrations and Nominal Track Targets

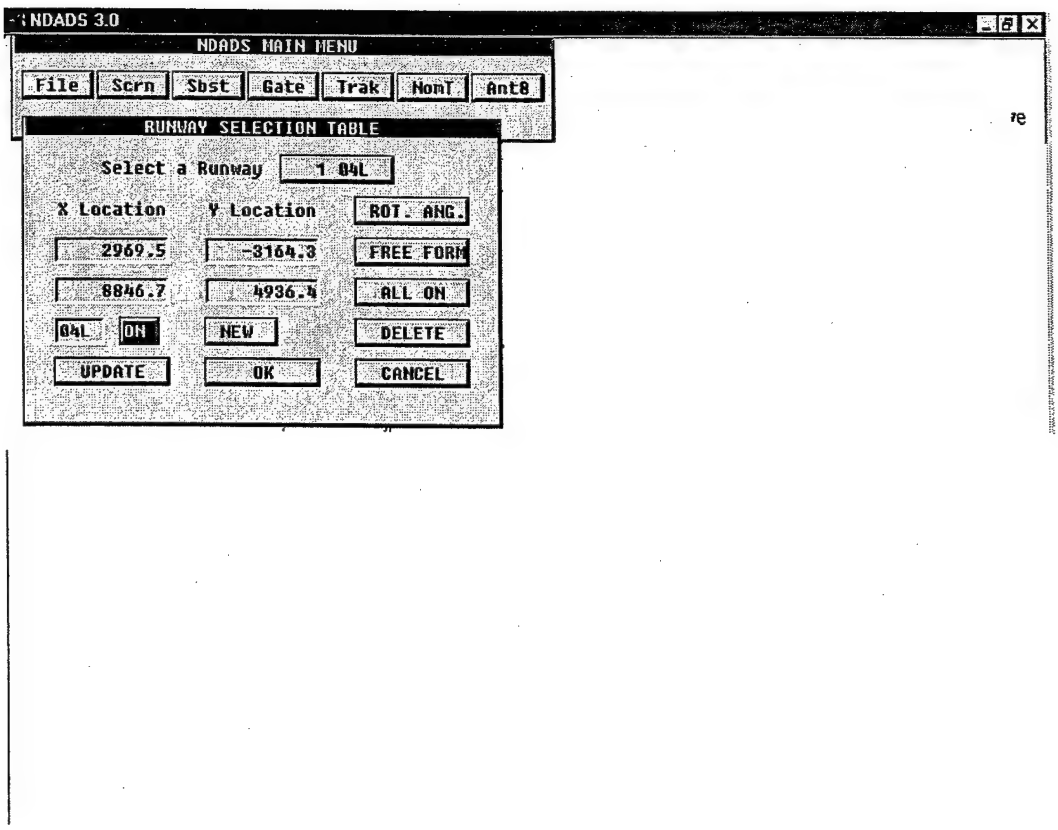

Figure 14. Runway Selection Table

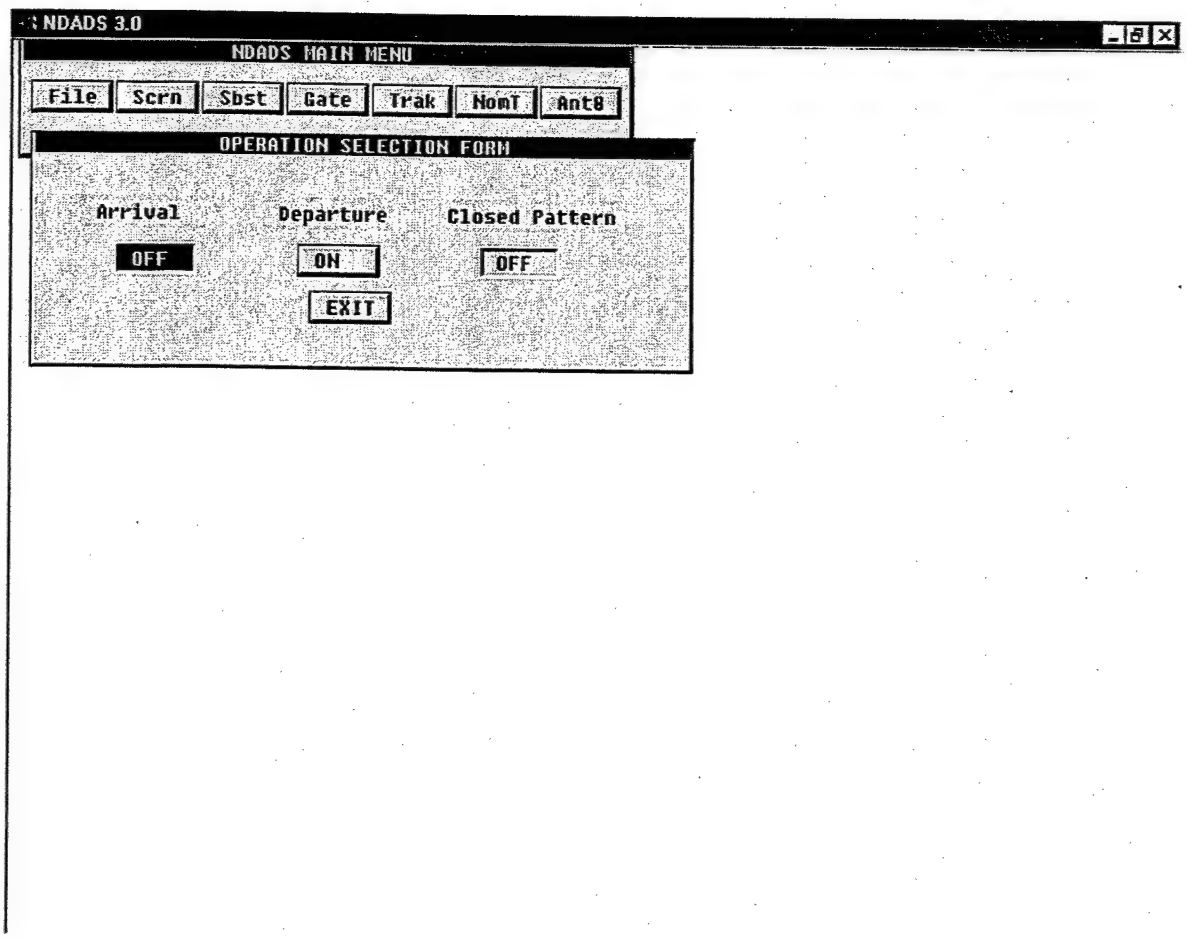

Figure 15. Operation Selection Form

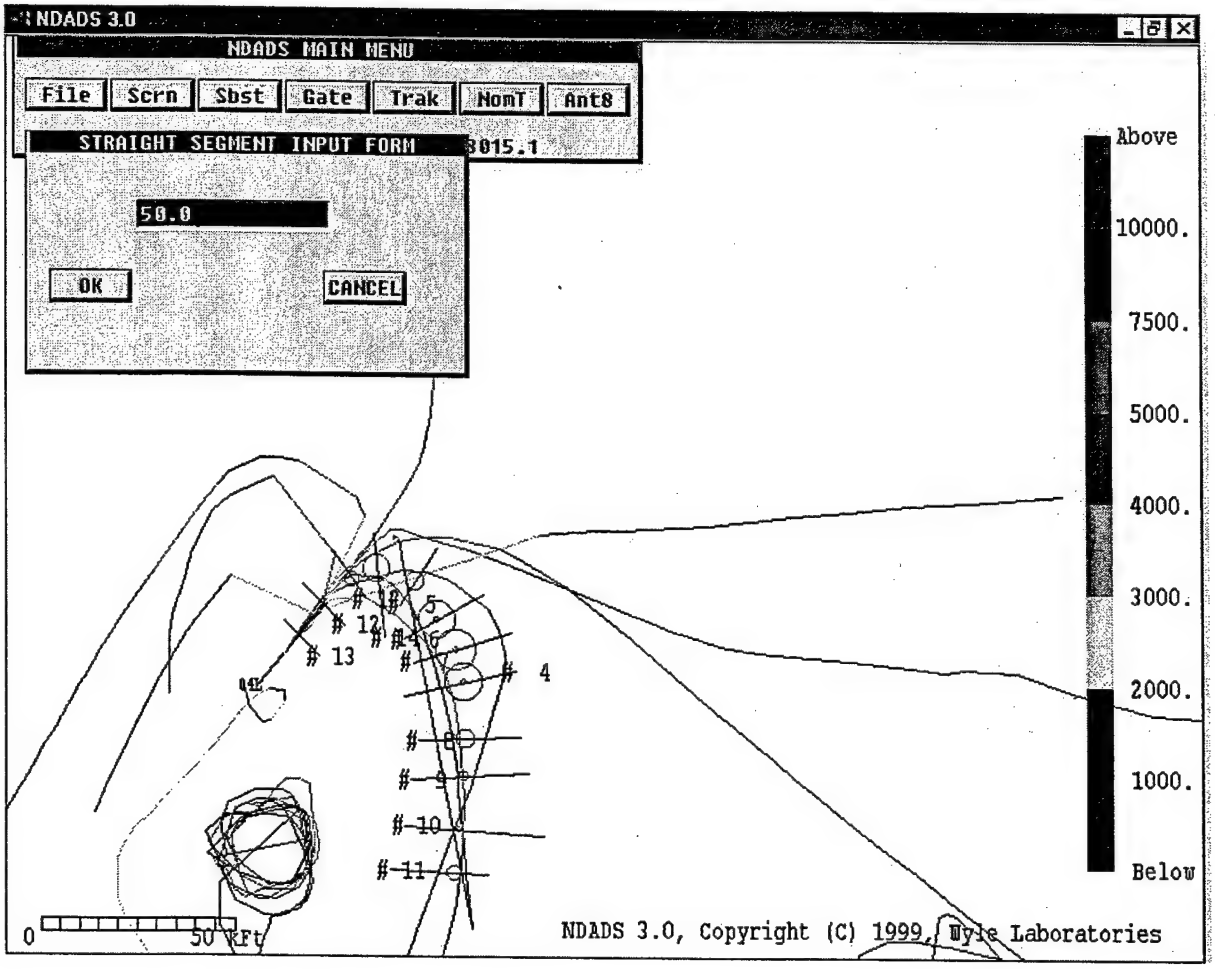

Figure 16. Straight Segment Input Form

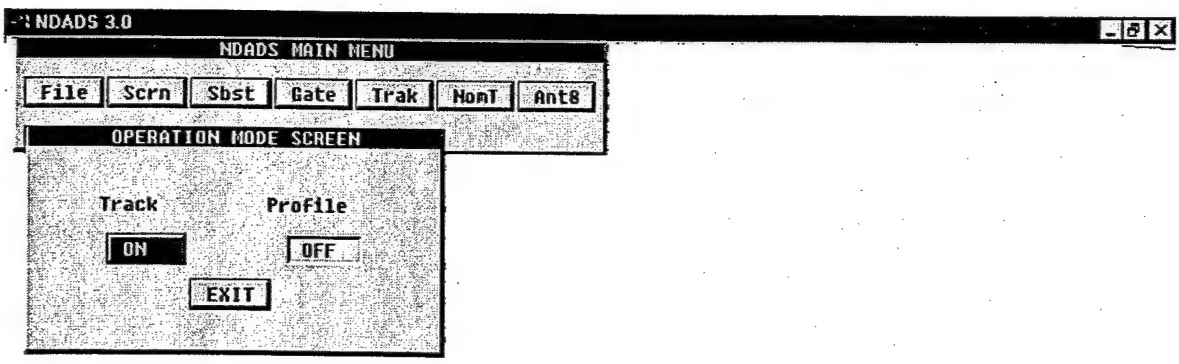

Figure 17. Operation Mode Screen

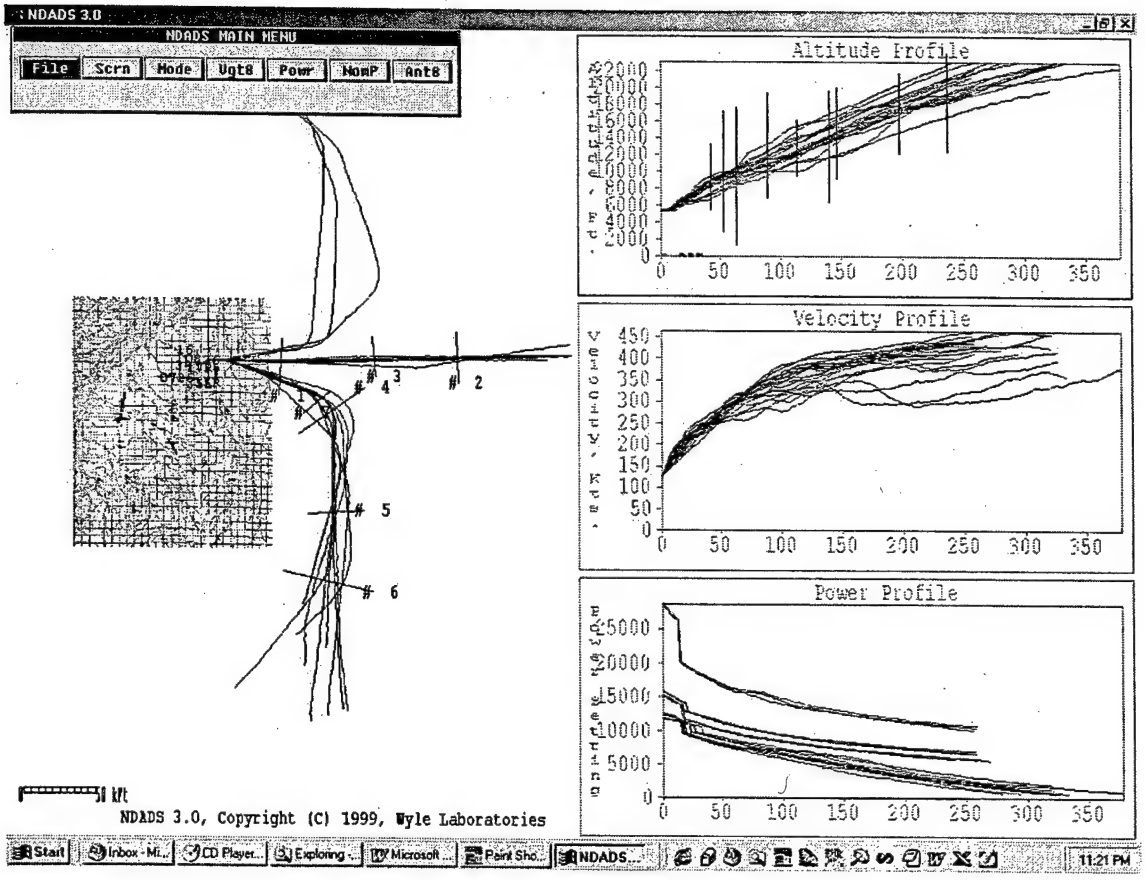

Figure 18. Profile Mode

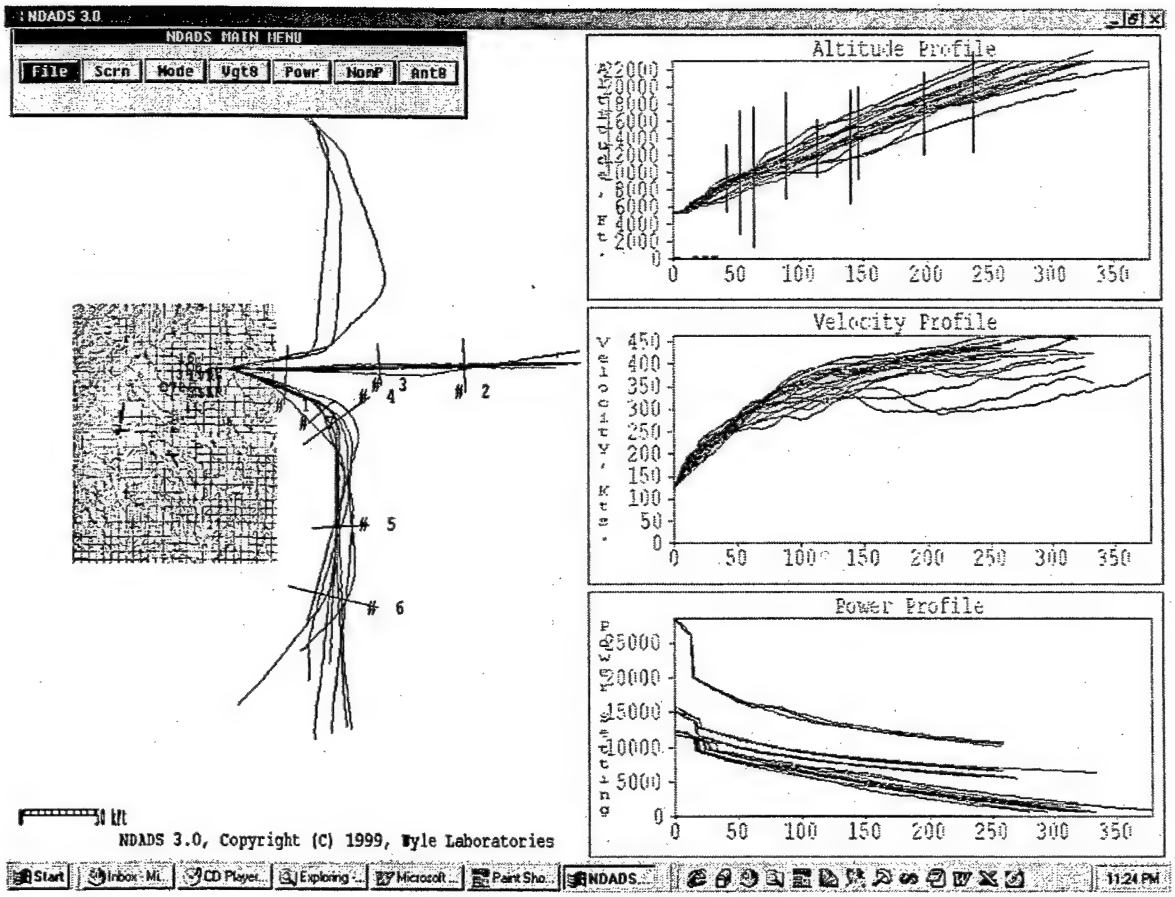

Figure 19. Nominal Profile Creation

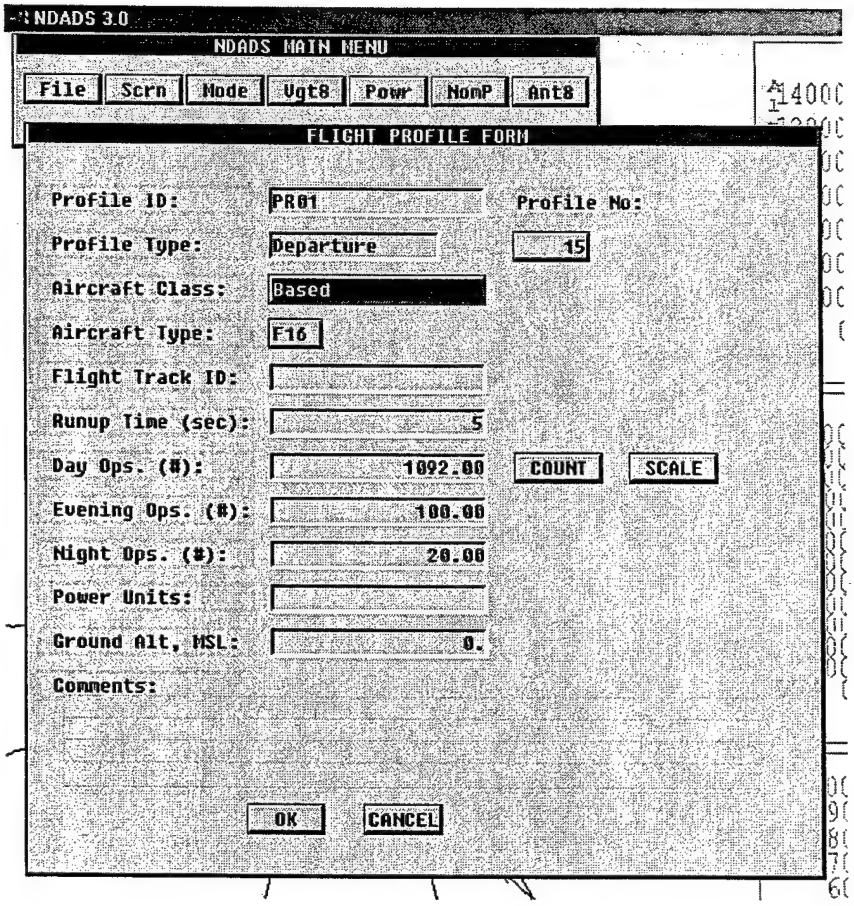

Figure 20. Flight Profile Form

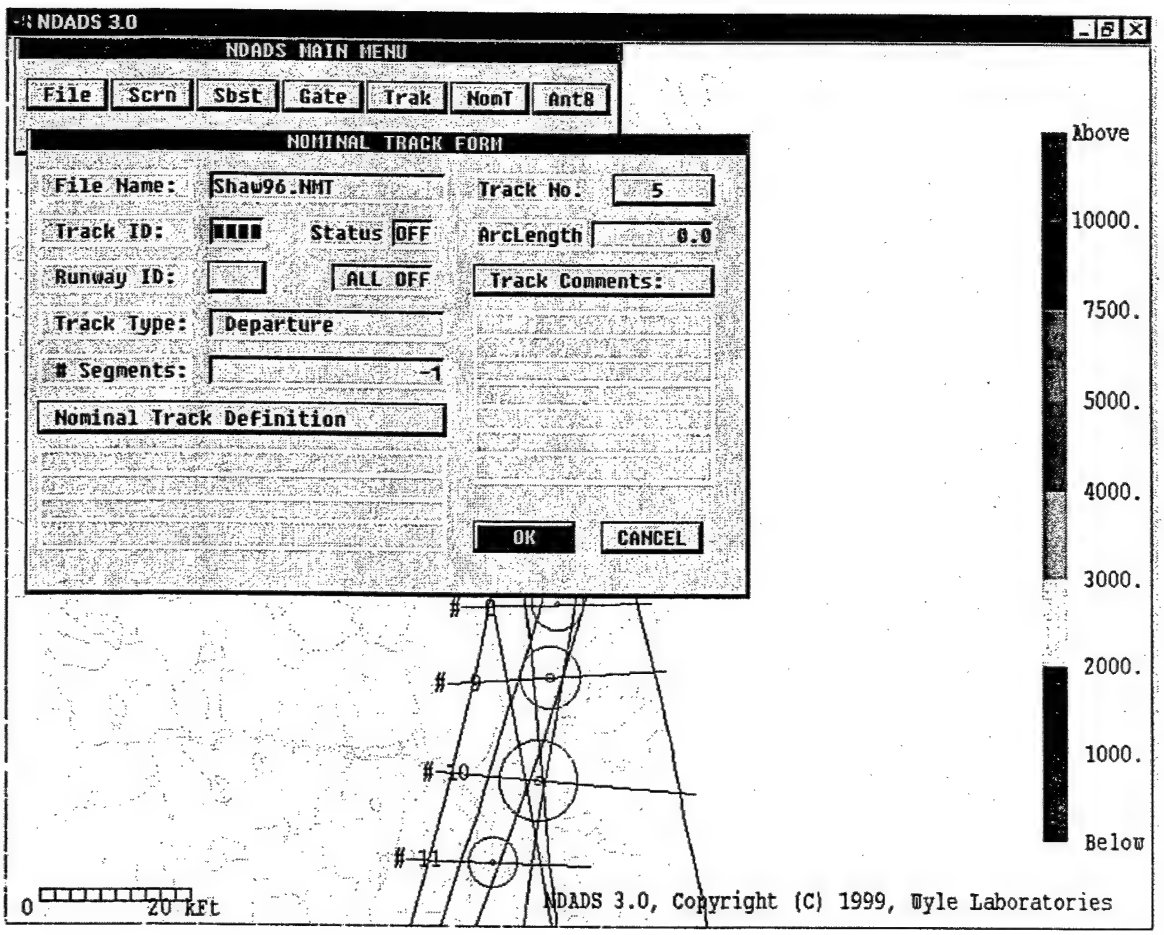

Figure 21. Nominal Track Form

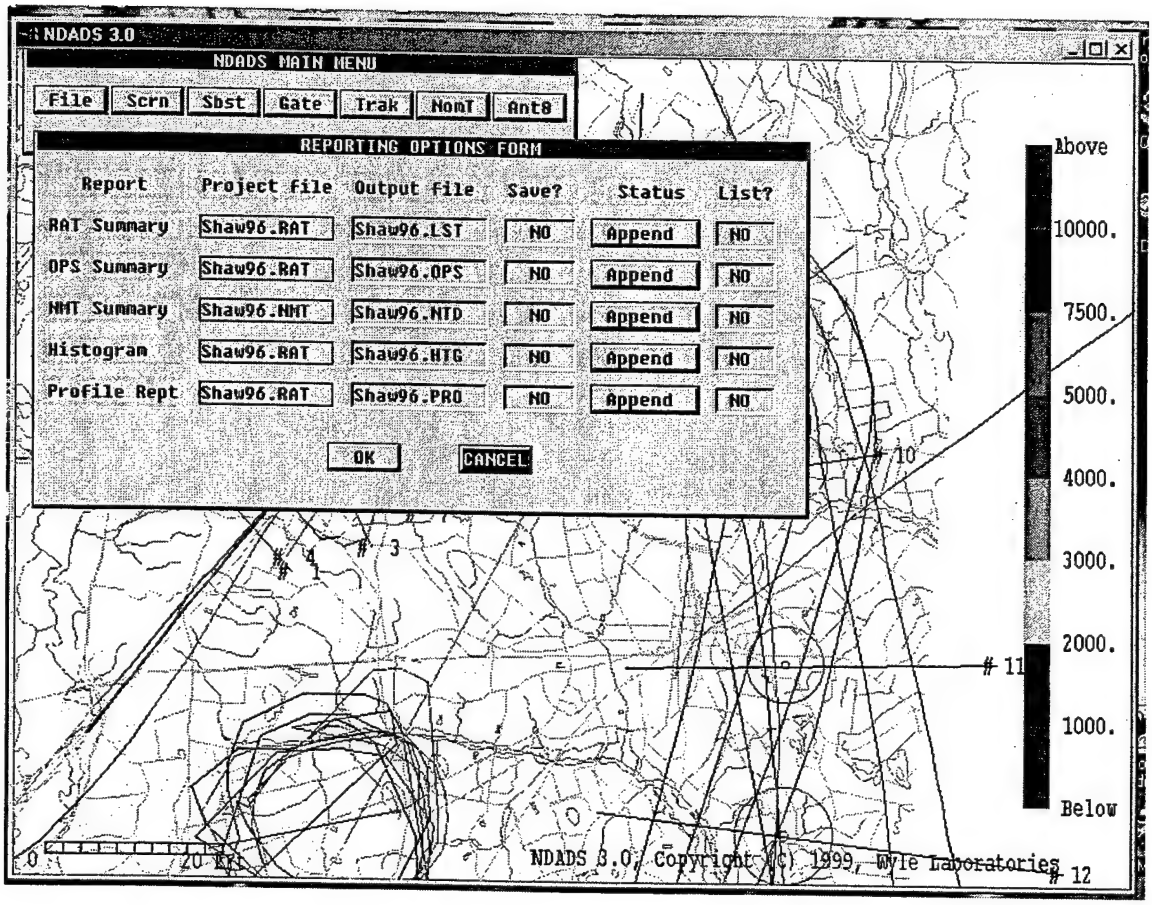

Figure 22. Reporting Options Form

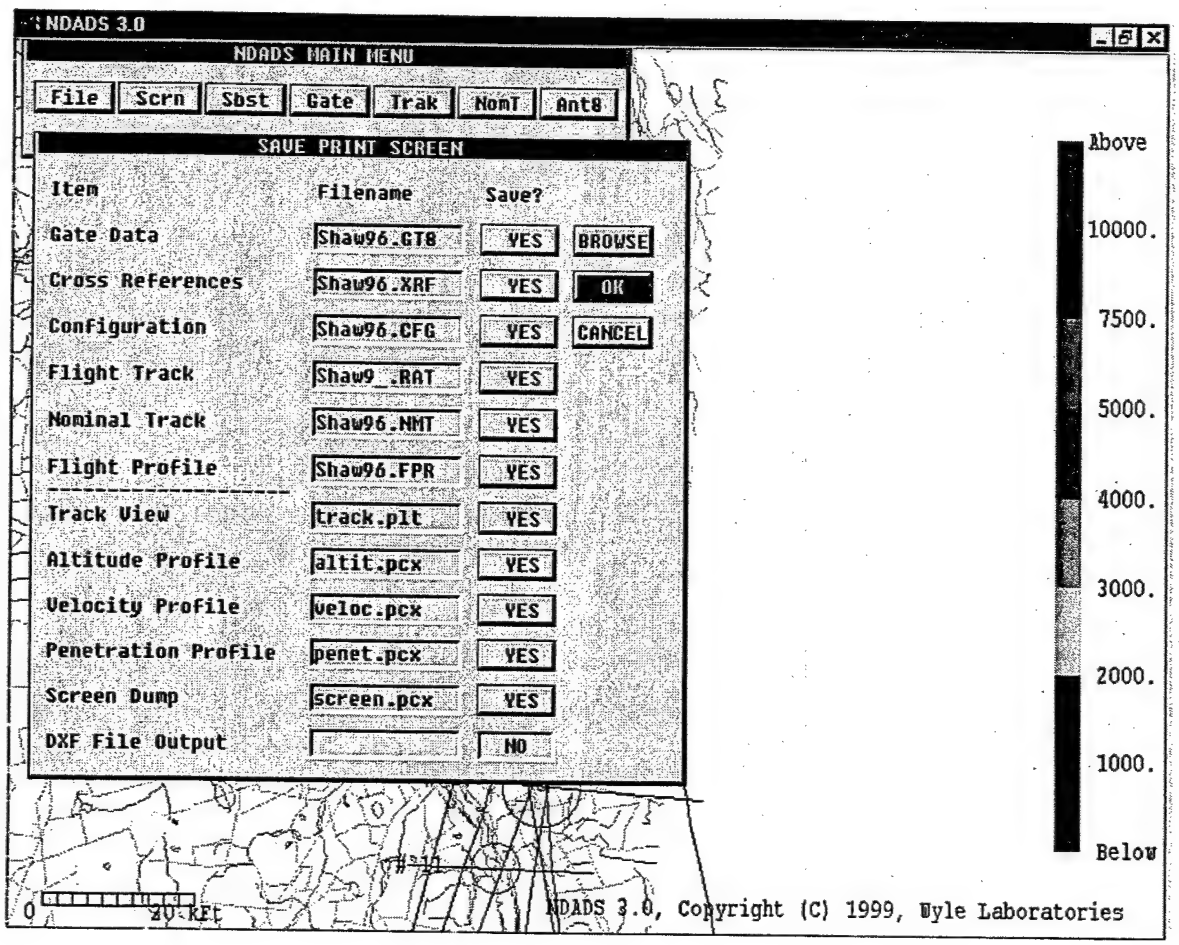

Figure 23. Save/Print Screen

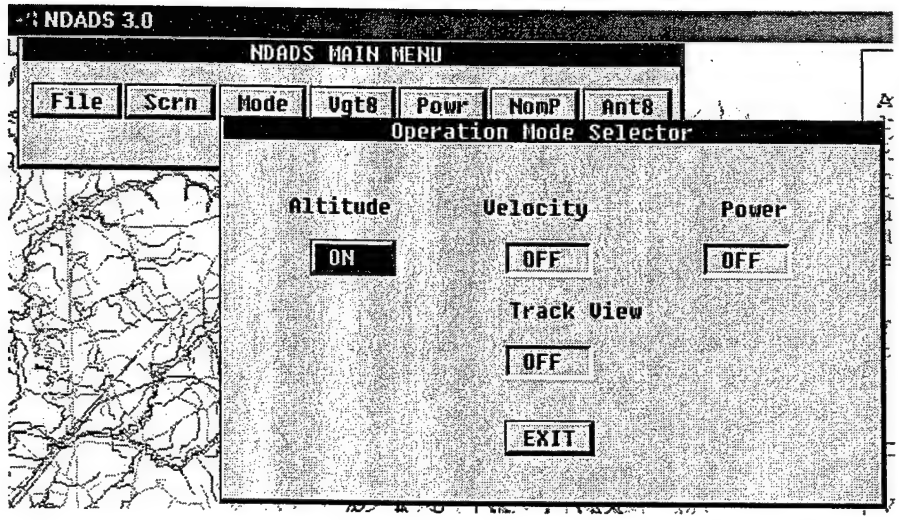

Figure 24. Operation Mode Selector

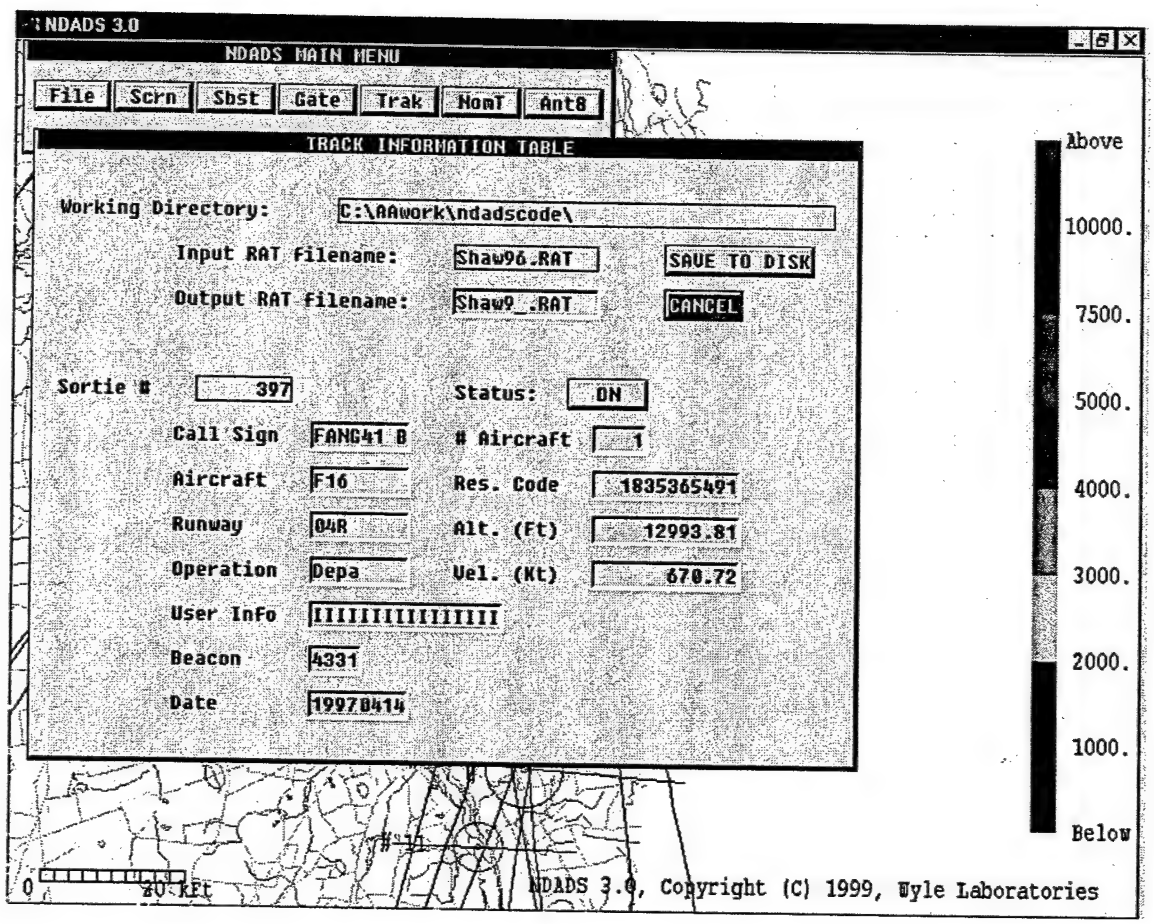

Figure 25. Track Information Table

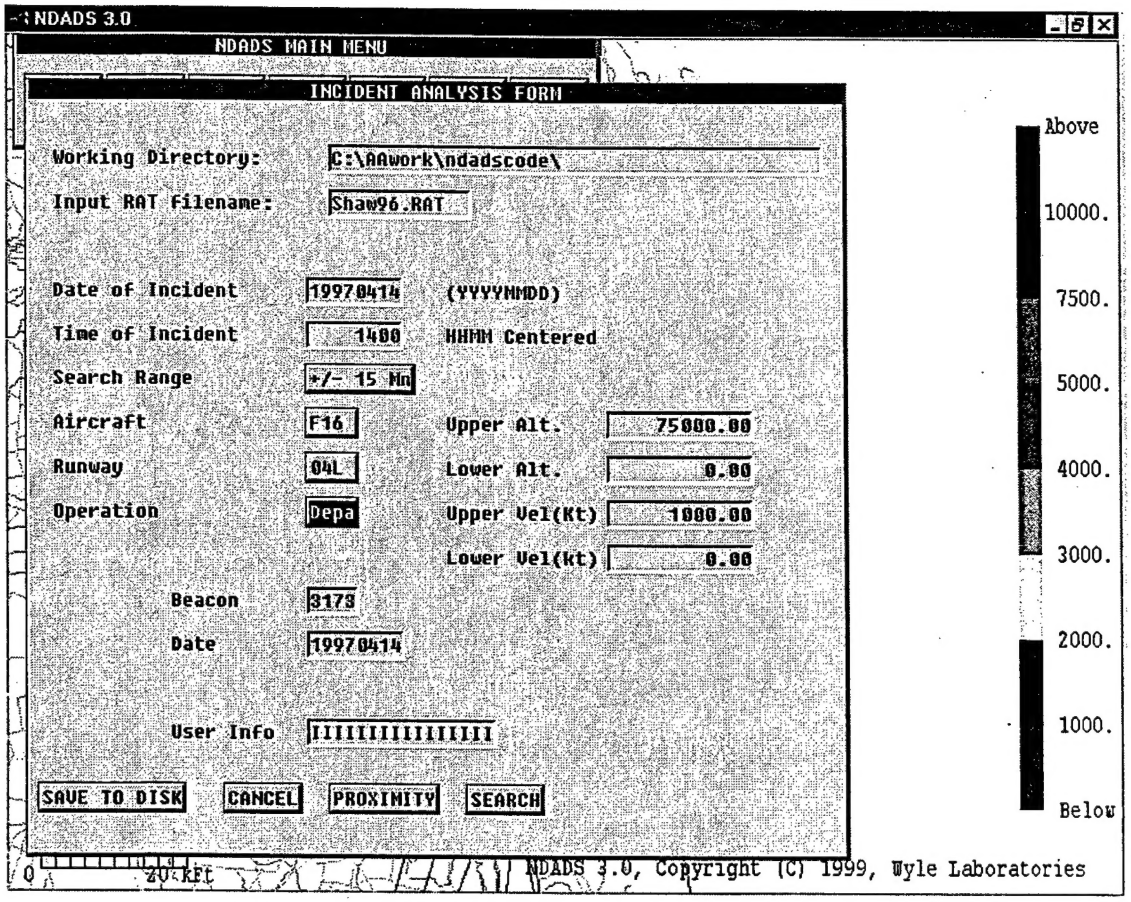

Figure 26. Incident Analysis Form

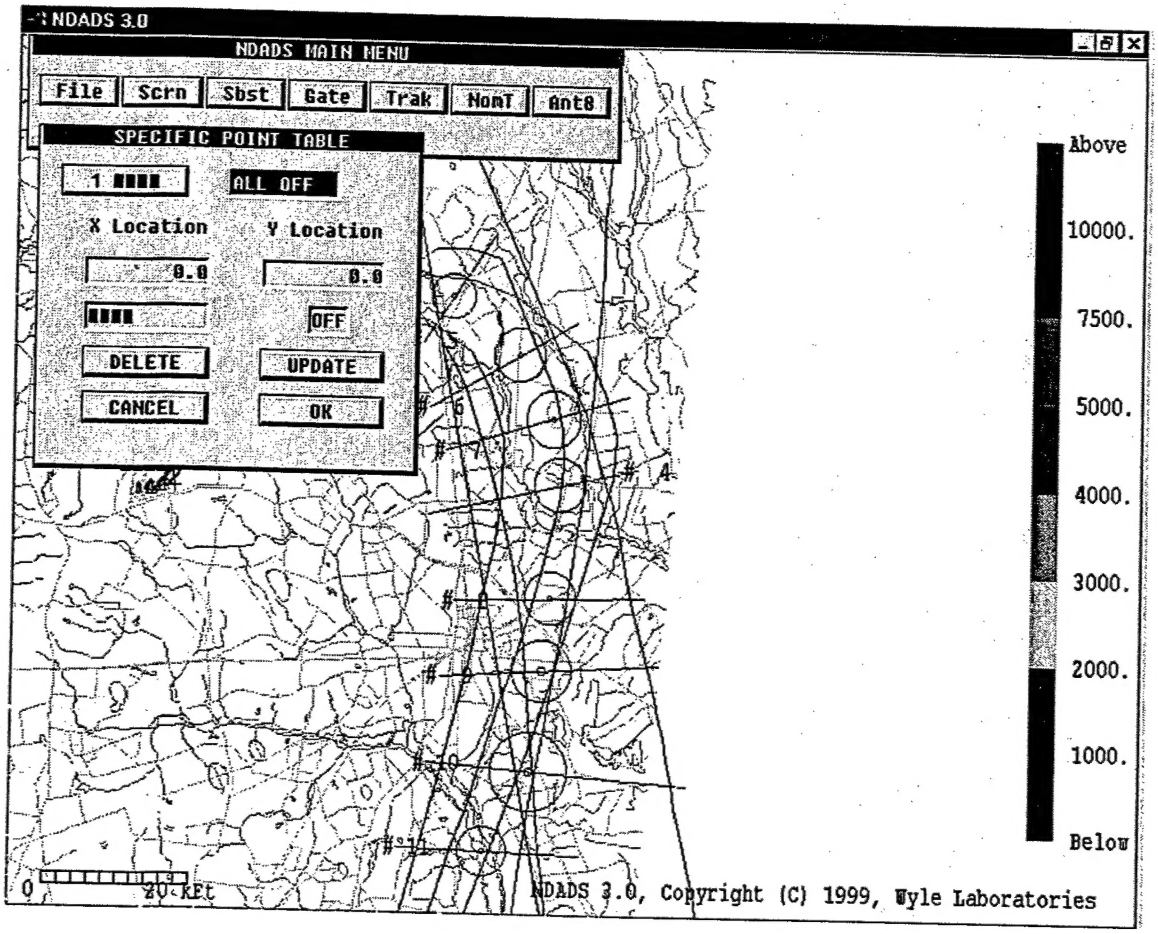

Figure 27. Specific Point Table

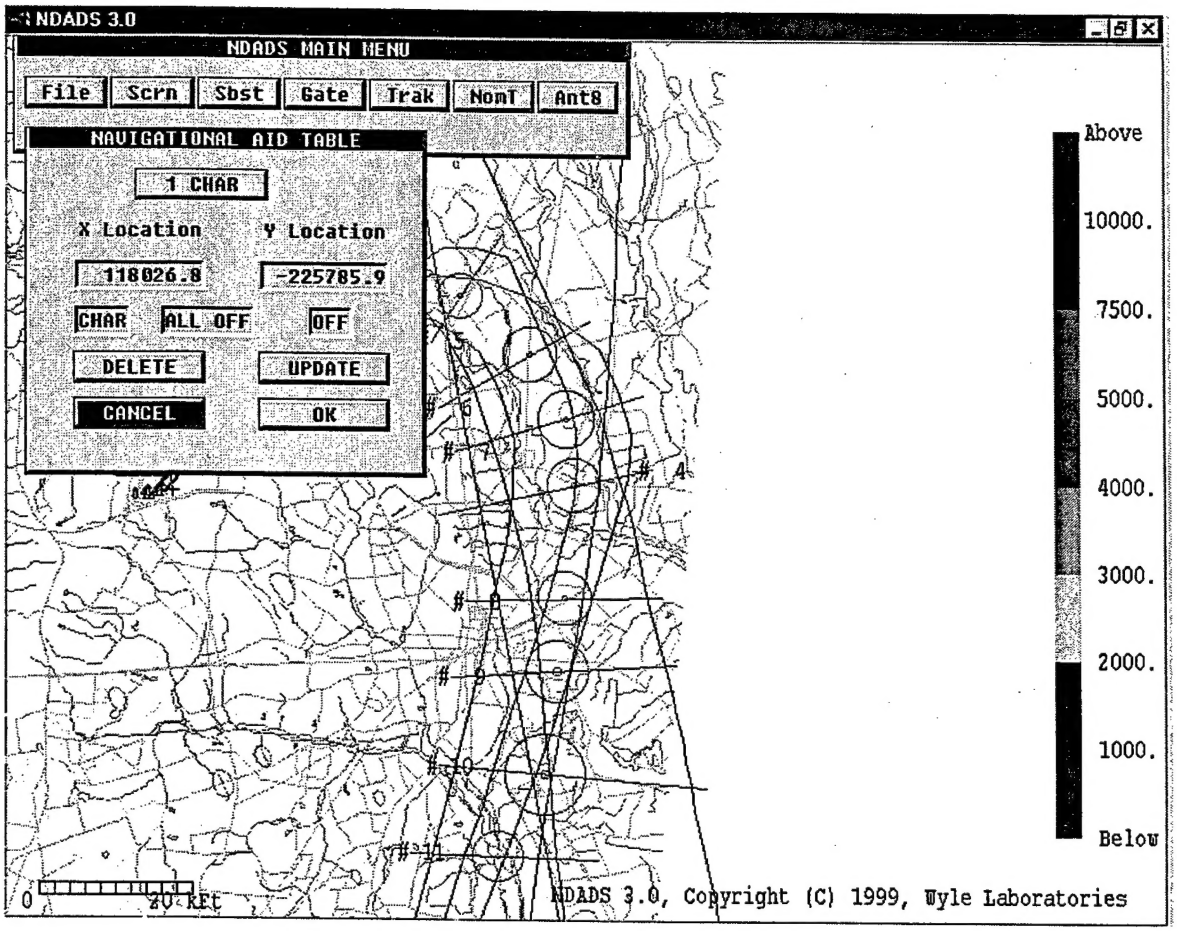

Figure 28. Navigational Aids Form

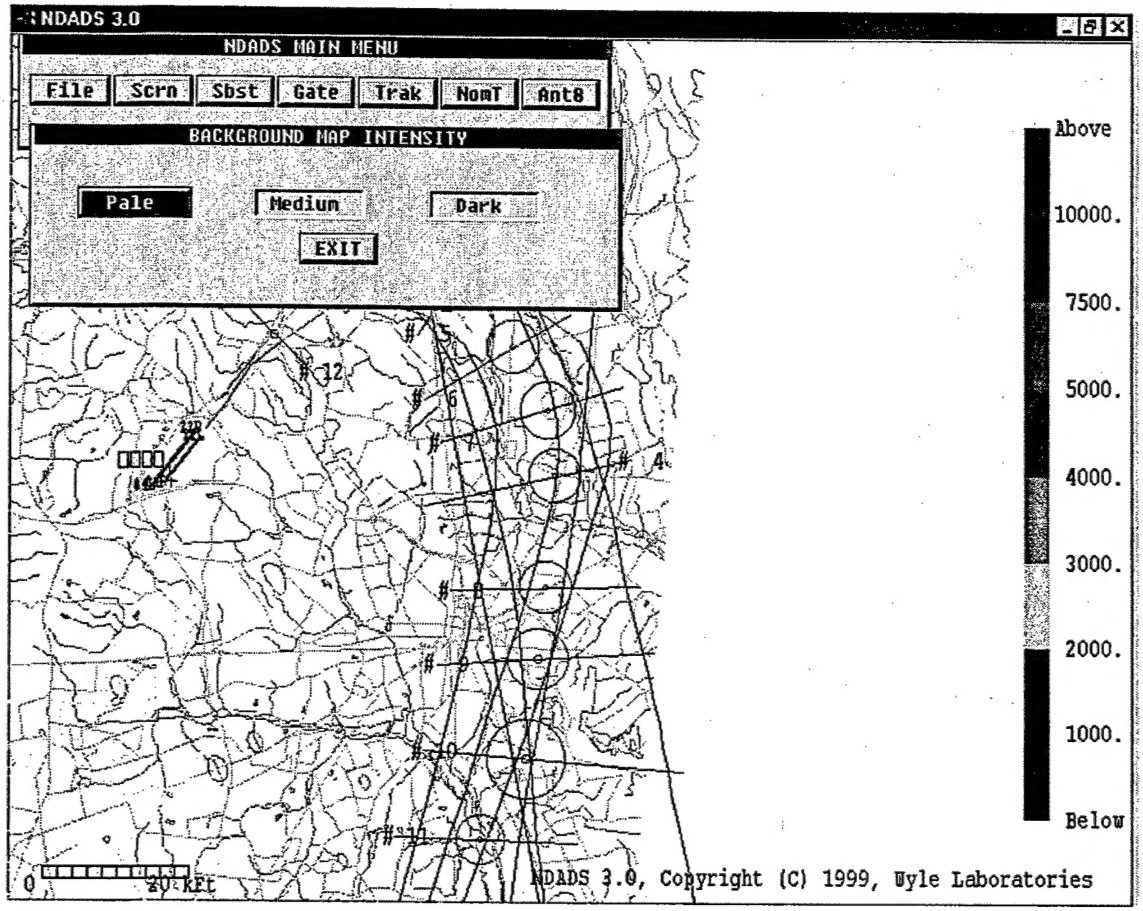

Figure 29. Background Map Intensity Form